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TM 9-458

WAR DEPARTMENT

U.S. Dept. of Army
TECHNICAL MANUAL

U.S. Dept. of Army
12-INCH SEACOAST MATÉRIEL
12-INCH MORTAR M1912
MOUNTED ON
12-INCH MORTAR CARRIAGE
M1896MIII

August 19, 1942



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WAR DEPARTMENT,
WASHINGTON, August 19, 1942.

12-INCH SEACOAST MATÉRIEL

12-INCH MORTAR M1912

MOUNTED ON

12-INCH MORTAR CARRIAGE M1896MIII

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*This manual supersedes TR 1315-12M, December 14, 1927, including C 1, January 2, 1929; Ordnance Document No. 1709, December 13, 1913; and in part Ordnance Document No. 1986, August 8, 1914.

SECTION I

GENERAL

Scope	Paragraph 1
Characteristics	2
Data	3

1. **Scope.**—*a.* This manual is published for the information and guidance of the using arms and services.

b. There is included technical information required for identification, use, and care of the 12-inch mortar M1912 and carriage M1896MIII. This information is presented from the standpoint of

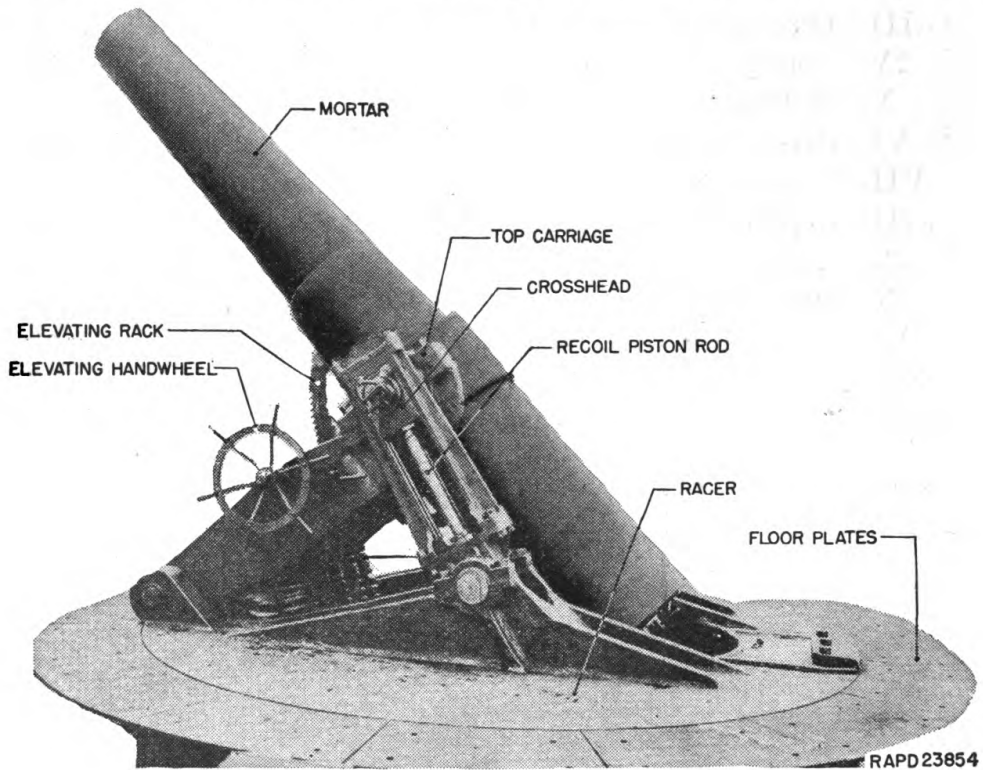


FIGURE 1.—12-inch mortar M1912 on mortar carriage M1896MIII.

personnel in the field, whose responsibilities may be divided into three main classes: operation, service, and repair. Sections I to VIII inclusive, cover the routine operation, service, and repair of the gun and mount. Complete instructions for routine operation, service, and repair of the organization equipment (except sighting and fire-control equipment) and for care and preparation of ammunition are included in sections IX through XII. Section XIII covers service of all the matériel when affected by gas.

c. Instructions for the use of the sighting and fire-control instruments are not included in this manual but are covered in FM 4-15.

2. Characteristics.—These 12-inch mortars are comparatively short-barreled weapons able to fire in all directions (360° traverse) but only at high angles of elevation. The maximum elevation attainable is approximately 65°. The minimum elevation (just clearing the emplacement walls) is 45°. The weapon must be depressed to 0° between rounds for loading. These mortars are no longer manufactured.

3. Data.—*a. 12-inch mortar M1912.*

Length, total over-all.....	inches	208.
Length, muzzle to breech face.....	do	200.
Length of bore in calibers.....		15.
Maximum diameter of chamber.....	do	12.5.
Weight, including breech mechanism.....	pounds	33,300.
Type of construction.....		Wire wound.
Rifling:		
Twist.....		Right hand, increasing from 1 turn in 40 calibers to 1 turn in 20 calibers.
Number of grooves.....		108.
Groove, width.....	inches	0.2091.
Groove, depth.....	do	0.06.
Land, width.....	do	0.14.
Breech mechanism:		
Type of breechblock.....		Slotted screw.
Type of breech operating mechanism.....		Stockett.
Power.....		Hand.
Type of firing mechanism.....		Combined friction and electric.
Model of firing mechanism.....		Seacoast firing mechanism M1903.
Muzzle velocity, maximum (700-lb. projectile—zone 10).....	feet per second	1,800.
Muzzle velocity, maximum (1,046-lb. projectile—zone 8A).....	feet per second	1,200.
Range, maximum (700-lb. shell).....	yards	17,895.

Type.....	Fixed.
Total weight..... pounds	132,000.
Total weight..... tons	66.
Elevating mechanism:	
Type.....	Spur.
Power.....	Hand.
Change in elevation for one turn of elevating handwheel..... degrees	9.46.
Elevation for firing (maximum)..... do	65.
Elevation for firing (minimum)..... do	45.
Elevation for loading..... do	Zero.
Method of reducing friction in trunnions.....	Bushing.

Type of bearing.....	Roller.
Mean diameter of roller path..... feet.....	12¼.
Traverse for 1 turn of traversing handwheel	
degrees..	2.2.
Maximum traverse..... do.....	360.
Base ring, outer flange diameter..... feet.....	14¼.
Racer diameter..... do.....	14.

Type	Hydraulic.
Number of cylinders	2.
Length of recoil	inches 23.
Orifices	Grooves.
Buffer	Dashpot.

Type.....	4 columns of springs.
Force holding mortar in battery..... tons..	50½
Sections per column (each section consisting of an inner and an outer spring).....	5.

Electrical data:

Lighting circuit—

Power-----	110 volt d-c.
Lamps, type (azimuth and quadrant)-----	Electric bayonet base, double contact, frost- ed bulb, 8 candle power, 12-16 volt.
Switch-----	5-ampere, double pole.

Firing circuit—

Power-----	Magneto type MA.
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c. Sighting and fire-control instruments.—(1) The sighting equipment supplied with this mortar may including the following instruments:

- (a) Clinometer.
- (b) Telescope.
- (c) Telescope mount.
- (d) Gunner's quadrant.
- (e) Bore sight.
- (f) Clinometer bore rest.

(2) The fire-control equipment supplied with this mortar may include the instruments listed below. At various harbor defenses the model of any one item may vary. It is also possible that some of the items listed below may not be used at a particular battery.

- (a) Scale arm M1906.
- (b) Adjustment board.
- (c) Range correction board.
- (d) Deflection board.
- (e) Plotting board.
- (f) Spotting board.
- (g) Percentage corrector.
- (h) Depression position finder.
- (i) Wind component indicator.
- (j) Azimuth instrument.
- (k) Set-forward rule.
- (l) Prediction scale.
- (m) Observation telescope.

d. Subcaliber gun (2.95-inch).

Weight of subcaliber tube	----- pounds	224.
Caliber	----- inches	2. 953.
Length of bore, including chamber	----- do	31. 6.
Length of rifled portion of bore	----- do	24. 33.
Rifling, uniform, 1 turn in 25 calibers, right-hand twist:		
Number of grooves	-----	30.
Width of grooves	----- inch	0. 23.
Depth of grooves	----- do	0. 023.
Capacity of powder chamber	----- cubic inches	34. 9.
Weight of projectile	----- pounds	18.
Weight of cartridge case	----- do	1. 45.
Muzzle velocity:		
18-pound projectile	----- feet per second	550-700.
Maximum chamber pressure		
	pounds per square inch	18, 000.
Maximum range	----- yards	4, 142.
Minimum range	----- do	1, 975.

SECTION II

DESCRIPTION OF MORTAR

12-inch mortar M1912	-----	Paragraph 4
Breech mechanism	-----	5
Firing mechanism	-----	6

4. 12-inch mortar M1912.—This mortar is of the wire wound type. The jacket (fig. 3) fits over the rear end of the tube and projects beyond it. The breech bushing is screwed into the end of the jacket and the breech mechanism is assembled into the bushing. The breech bushing bears interrupted threads for the breechblock.

5. Breech mechanism.—*a. General.*—The function of the breech mechanism is to close the breech and prevent the escape of burning gases. The breechblock is the main part of the mechanism. It closes the breech and is hinged like a door so that it can be swung open for loading. It is moved by an operating crank. The crank rotates the worm wheel by means of a worm on the right end of its shaft. The worm wheel fits on the lower squared end of the hinge pin and operates the compound gear keyed to the hinge pin. This compound gear rotates the breechblock and also moves it back out of the breech recess onto the tray. The tray supports the breechblock

and pivots about the hinge pin to swing the breechblock clear of the breech recess.

b. Principal parts.—The principal parts of the breech mechanism are: tray hinge, hinge pin, operating crank, operating worm, worm wheel, tray, tray latch, tray-latch catch, compound gear, breechblock, breechblock-locking device, obturator, gas-check pad, split rings, and filling-in disk.

(1) *Hinge.*—The tray hinge (fig. 2) is secured to the breech face of the mortar by screws. It is set into the mortar jacket and breech bushing flush with the breech face, preventing the bushing from rotating in the jacket. There are two lugs on the hinge for the hinge pin. The lower end of the hinge forms a housing for the operating worm.

(2) *Hinge pin.*—The hinge pin (figs. 2, 3, and 4) passes through the lugs of the tray hinge and is held in place by a nut on the lower end. Attached to the hinge pin are the compound gear, the tray, and the worm wheel. The tray is free to revolve about the pin. There are grooves on the hinge pin for lubrication purposes.

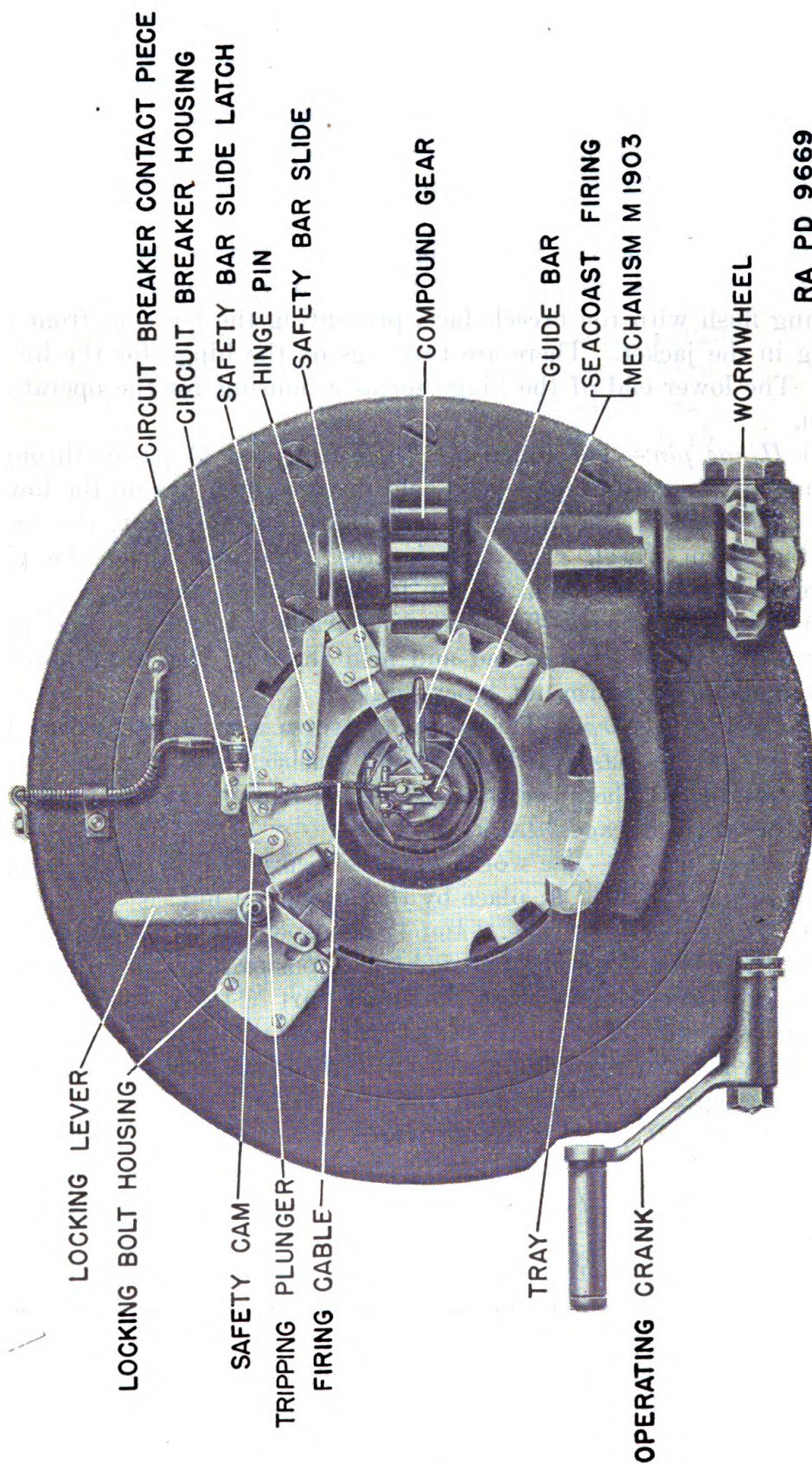
(3) *Operating crank.*—The operating crank is secured to the operating worm by its squared end and held there by the crank spindle and the operating worm nut taper pin.

(4) *Operating worm.*—The operating worm is set in the lower part of the hinge. It has two ball-bearing washers held together by a copper retainer. These bearings reduce the friction due to the thrust when the worm engages the worm wheel.

(5) *Worm wheel.*—The worm wheel is secured to the lower end of the hinge pin and held in place by the hinge pin nut.

(6) *Tray.*—The tray (figs. 2 and 4) is suspended on the upper surface of the lower hinge lug and is held in position by the hinge pin. There is a ball bearing between the upper part of the lower hinge lug and the lower surface of the tray to permit easy rotation. The contour of the tray fits a corresponding contour in the lower part of the breechblock. When in closed position, the tray is held to the face of the mortar by means of a tray latch which fits in the tray-latch catch.

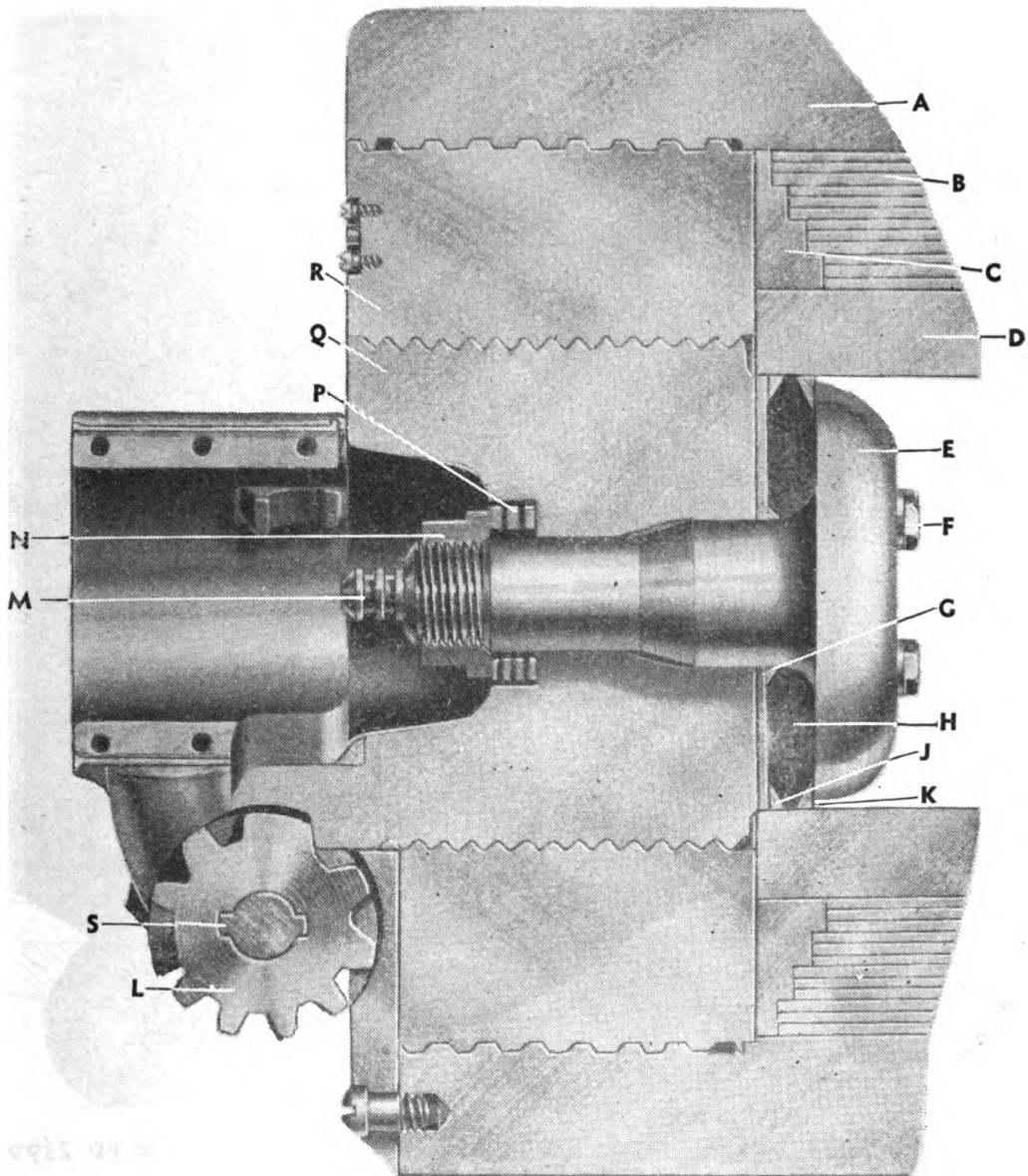
(7) *Tray latch.*—The tray latch pivots in a recess in the tray and is held in place by the tray-latch pivot. The operation of the tray latch is shown in figure 6. It locks the breechblock to the tray when the breech is opened and latches the tray to the breech face when the breech is closed. When the breechblock moves back onto the tray (in opening the breech) a projection on the bottom of the breechblock rotates the tray latch about its pivot. This unlatches the tray from the tray-latch catch and also allows the lock bolt to enter the hole in the rear of



RA PD 9669

FIGURE 2.—Breech mechanism, rear view.

the latch, locking the breechblock to the tray. When the breech is closed, the operating stud forces the locking bolt back into its recess, unlocking the tray latch. The tray-latch catch is held in a recess in the face of the mortar by two screws.



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|-----------------------------|---------------------------|------------------------------|
| A. Jacket. | G. Small split ring. | N. Obturator spindle. |
| B. Wiring (layers of wire). | H. Gas-check pad. | P. Obturator spindle spring. |
| C. A-ring. | J. Rear split ring. | Q. Breech block. |
| D. Tube. | K. Front split ring. | R. Breech bushing. |
| E. Obturator. | L. Compound gear. | S. Hinge pin. |
| F. Pressure plug. | M. Firing mechanism seat. | |

FIGURE 3.—Breech mechanism, section view.

(8) *Compound gear*.—The compound gear is held to the hinge pin by means of two keys. It rests on top of the tray beneath the upper hinge lug. About one-half of this gear is cut spiral and the other half cut spur. The spiral part of the gear engages in the spiral rack cut

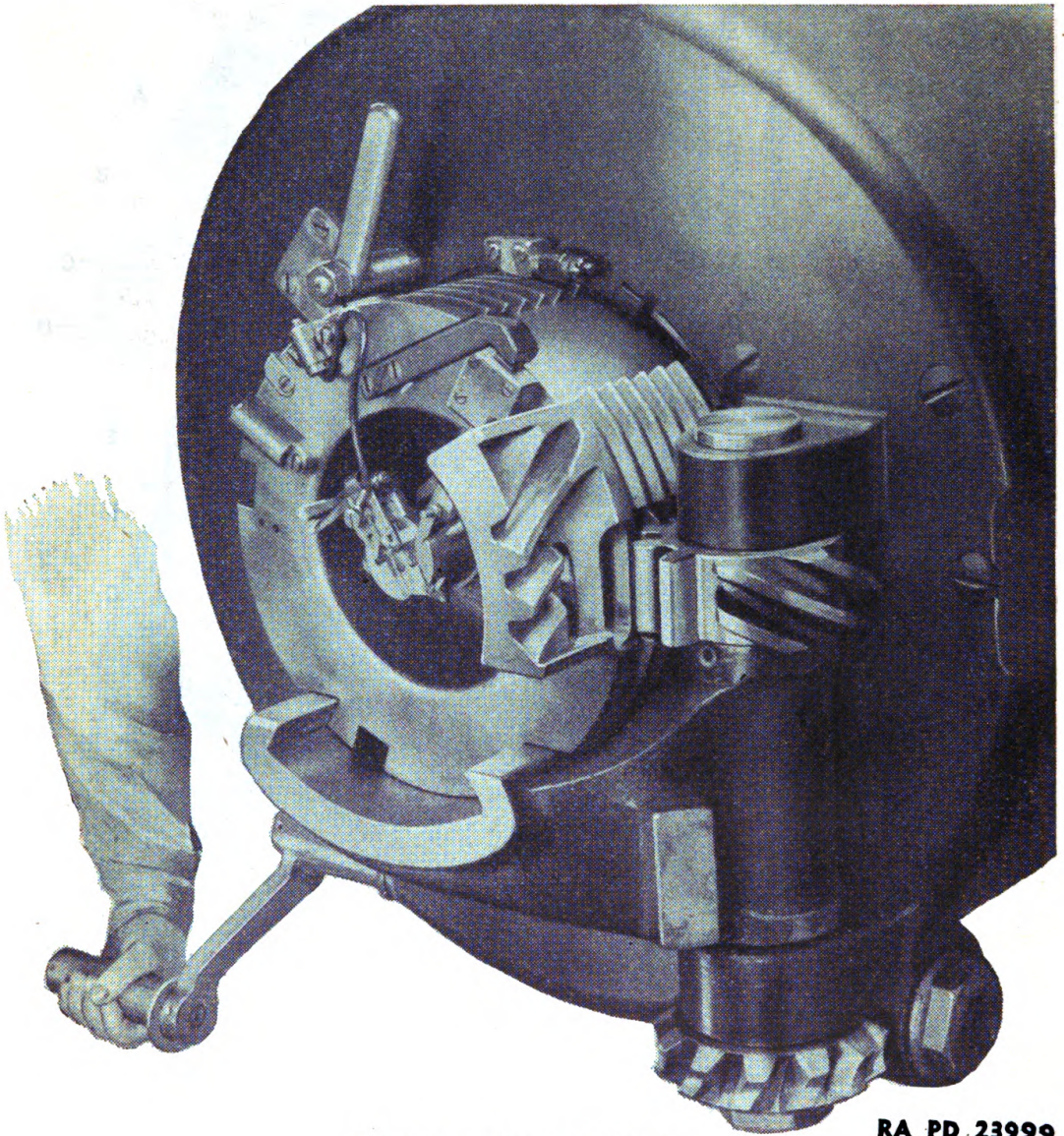


FIGURE 4.—Breech mechanism.

on the breechblock and causes the breechblock to revolve. The spur part then engages the breechblock and causes it to move to the rear onto the tray.

(9) *Breechblock*.—The breechblock (fig. 3) contains six threaded and six slotted sectors. A spiral rack and a spur rack on the breechblock engage the compound gear.

(10) *Breechblock locking device*.—The breechblock locking device is for locking the breechblock in its closed position and preventing any tendency of the breechblock to rotate during firing. It consists

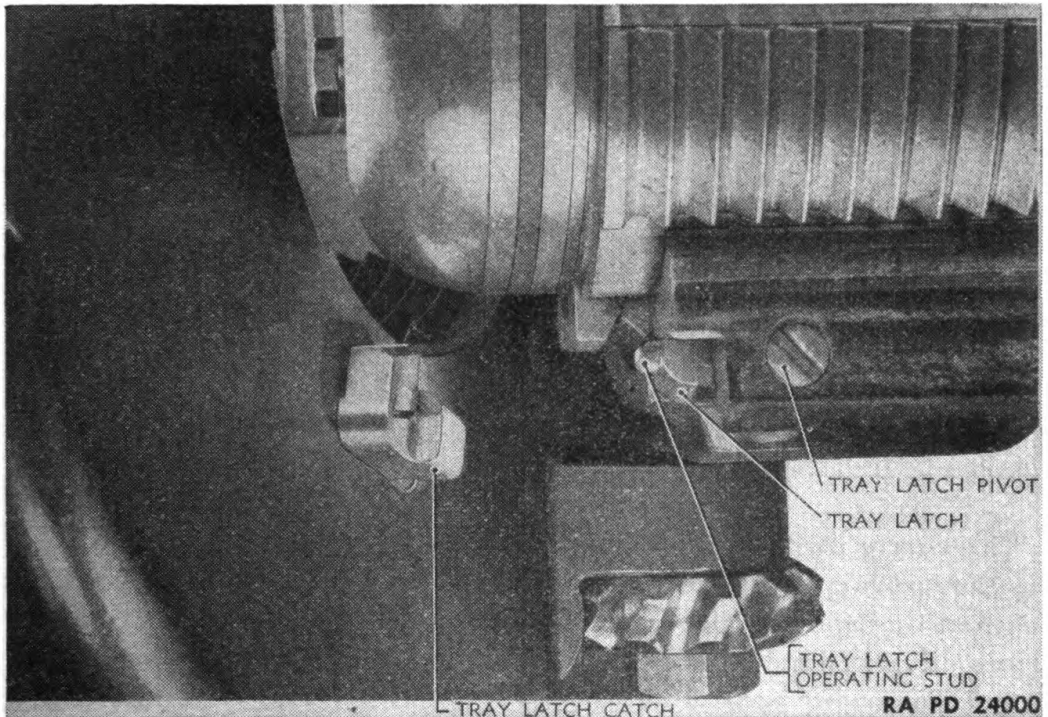


FIGURE 5.—Tray latch.

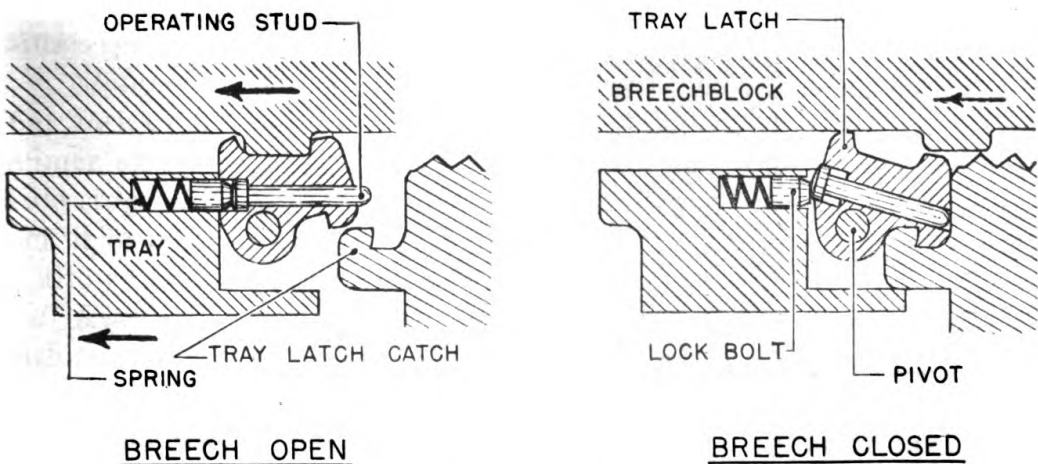
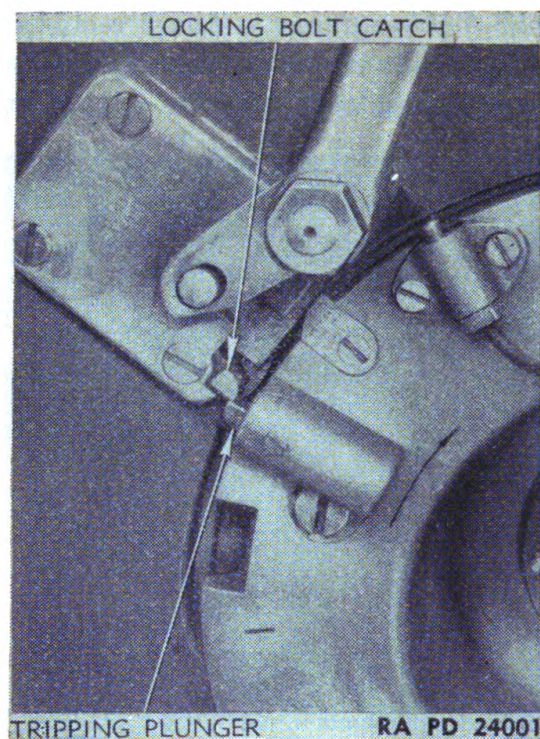


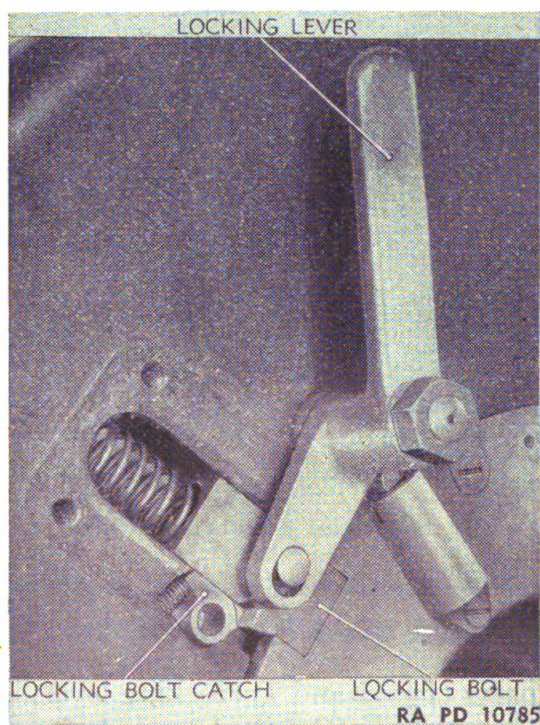
FIGURE 6.—Functioning of tray latch.

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of the following parts (figs. 2 and 7) : locking lever, locking-lever stud, locking bolt, locking-bolt spring, locking-bolt housing, locking-bolt catch, bolt-catch spring, tripping plunger, tripping-plunger spring, tripping-plunger housing, and safety cam.



① Tripping.



② Locked.

FIGURE 7.—Breechblock locking device.

6. Firing mechanism.—*a. General.*—(1) Seacoast firing mechanism M1903 (fig. 8) is attached to the rear end of the obturator spindle by means of a hinged collar. This mechanism is constructed to receive either an electric or a friction primer. When the slide is in its uppermost position, the primer is inserted in the vent in the obturator spindle, the head of the primer resting in its seat in the ejector. When the slide is pushed down, it passes over the primer wire and also incloses a button on the end of the wire.

(2) A pull on the lanyard rotates the firing leaf about its axis, thereby drawing out the primer wire of friction primers. The closing of an electric circuit, which enters the mechanism through the electric terminal, fires electric primers. A safety lug which engages in a groove in the firing leaf prevents the latter being drawn to the rear before the slide is all the way down.

(3) The principal parts of the firing mechanism are: hinged collar, housing, slide, firing leaf, safety bar, and ejector.

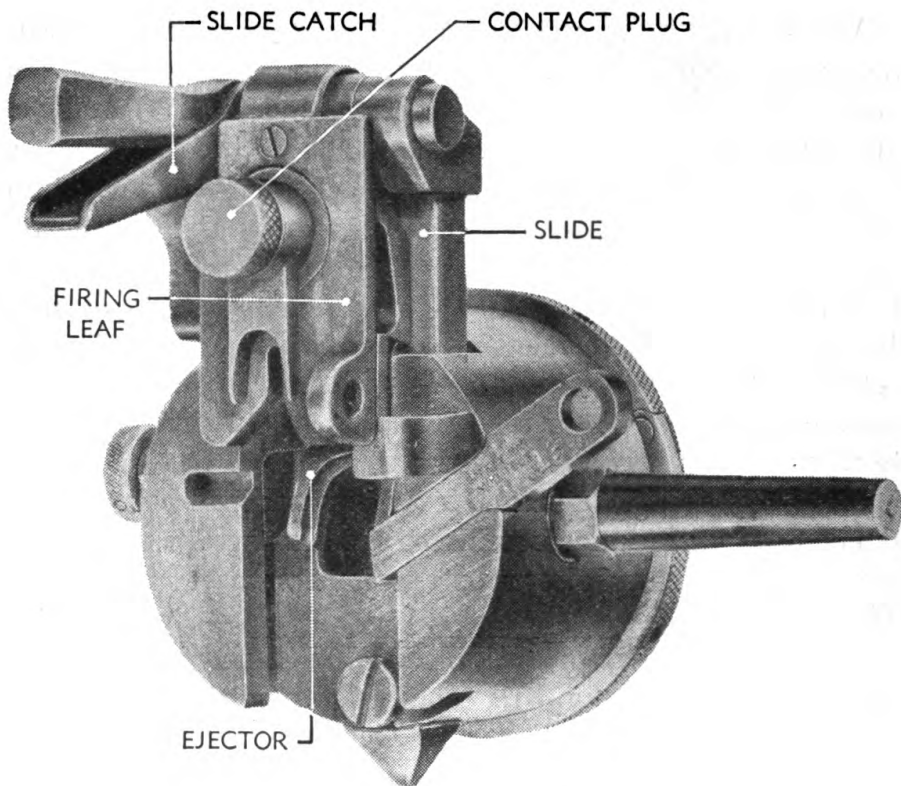
b. Hinged collar and housing.—(1) *Fastening.*—Two grooves (P, fig. 9) on the inner surface of the hinged collar engage in corresponding ribs on the spindle (M, fig. 3). The housing is threaded to receive the hinged collar, and a spring catch locks the collar to the housing when it is fully screwed home. The collar is thus prevented from opening and secures the housing to the spindle.

(2) *Guide bar.*—A guide bar (M, fig. 9) projects from the right side of the housing into a groove cut in the breechblock recess and causes the housing to rotate with the breechblock.

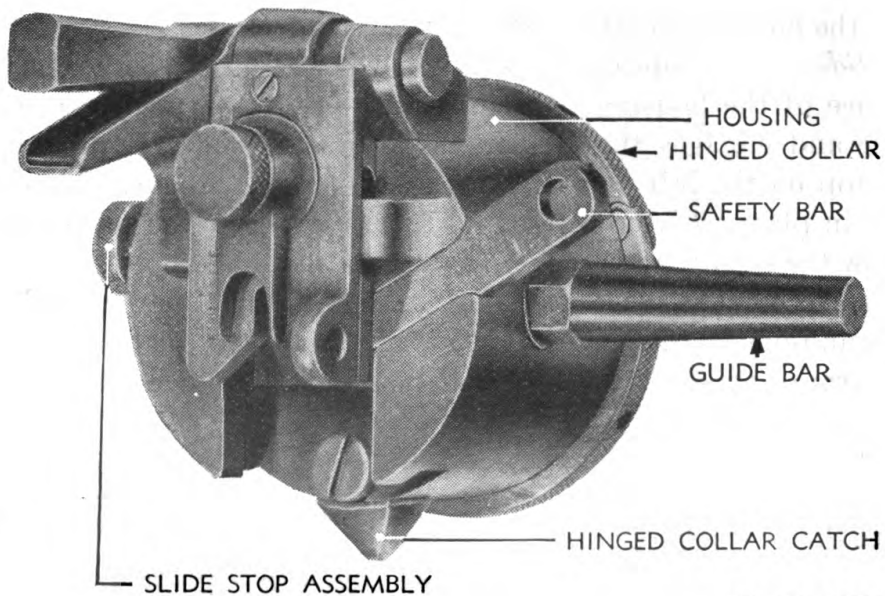
c. Slide.—The slide (fig. 10) travels vertically in grooves cut in the rear face of the housing. When in its lowest position, it covers the primer and engages the primer wire. Its motion is limited by the slide stop on the left side of the housing. The slide catch serves to lock it in place when lowered, and to support it at the proper height to allow the primer to be inserted when raised.

d. Ejector.—The ejector (B, fig. 9) is an irregularly shaped piece with trunnions on each side which enter two slots in the housing. The lower arm of this ejector is fork-shaped and hangs over the mouth of the primer seat under the head of the primer. The horizontal arm projects to the rear into a recess in the slide. When the latter is lifted, this arm is carried upward and the ejector rotated about its trunnions so as to throw the lower arm to the rear, ejecting the primer.

e. Firing leaf.—(1) The firing leaf (fig. 10) is pivoted to the slide at its upper end. It has a vertical slot cut in its lower edge through which the wire of the primer projects when the slide is in its lower or locked position. At the right-hand lower corner of the leaf is an



① Open position.



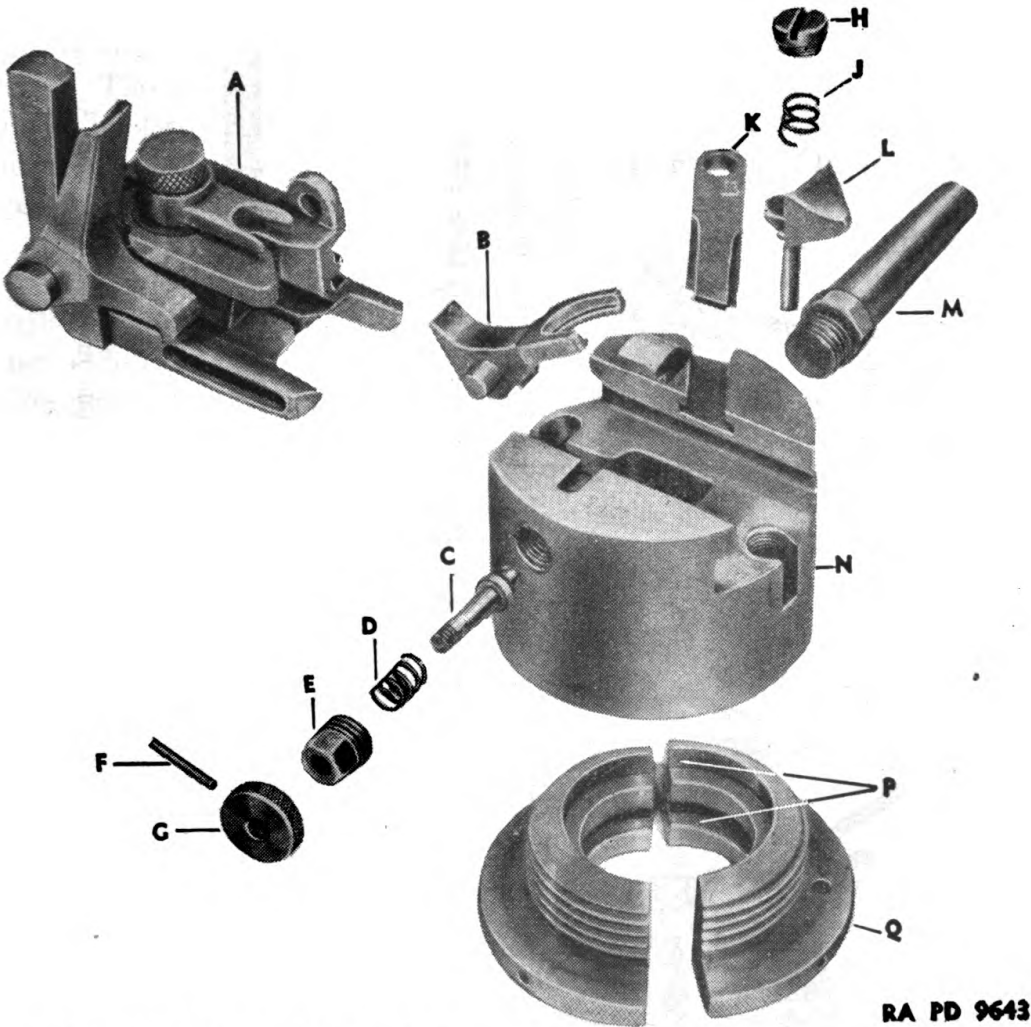
② Closed position.

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FIGURE 8.—Seacoast firing mechanism M1903, assembled view.

eye into which the lanyard is hooked for friction firing. When the leaf is drawn to the rear, it engages the button on the end of the primer wire, draws the wire out, and fires the primer frictionally.

(2) Electric connection with the primer is made through the arms of the contact clip, which incloses the button of the primer. The firing cable connects to the contact clip on the rear face of the leaf. The other end assembles to the circuit breaker contact.

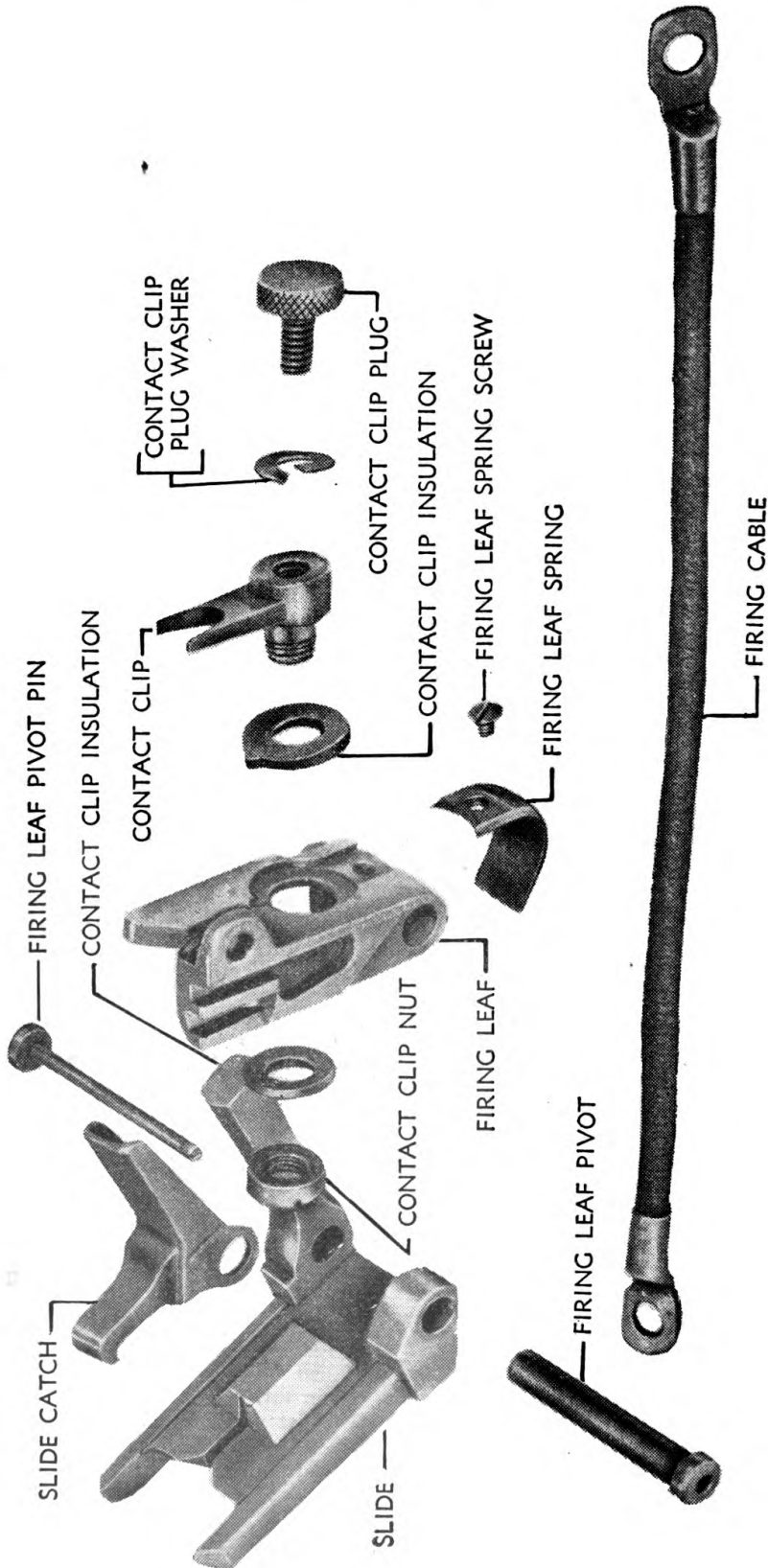


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- A. Seacoast firing mechanism slide.
- B. Ejector.
- C. Slide stop body.
- D. Slide stop spring.
- E. Slide stop housing.
- F. Taper pin.
- G. Slide stop nut.
- H. Hinged collar catch screw.

- J. Hinged collar catch spring.
- K. Firing mechanism safety bar.
- L. Hinged collar catch.
- M. Guide bar.
- N. Seacoast firing mechanism housing.
- P. Seat grooves.
- Q. Hinged collar.

FIGURE 9.—Firing mechanism housing, disassembled.



RA PD 9646

FIGURE 10.—Firing mechanism slide, disassembled.

f. Safety bar.—(1) The safety bar prevents accidental firing of the piece by the lanyard before the breech is fully closed, and a circuit breaker prevents accidental firing by electricity. The first motion of rotation of the breechblock forces the safety bar inward so as to engage the leaf and prevent its being drawn to the rear, while at the same time the electric circuit is broken by the same movement of rotation.

(2) The safety bar (K, fig. 9) is attached to the end of the safety-bar slide (fig. 2), and the safety-bar slide is operated by a cam surface in the breech bushing.

(3) The safety-bar slide latch is secured to the face of the breechblock by two screws. A projection on its outer end overhangs the outer end of the safety-bar slide, preventing the slide from being raised before the breechblock is closed.

(4) As the breechblock is rotated to closed position, the projection of the slide latch slides on a cam surface which raises the latch a sufficient amount to clear the end of the safety-bar slide. The safety-bar slide cam then follows its cam surface until the safety bar disengages from the firing leaf. The operation of this is the same for all mortars in service.

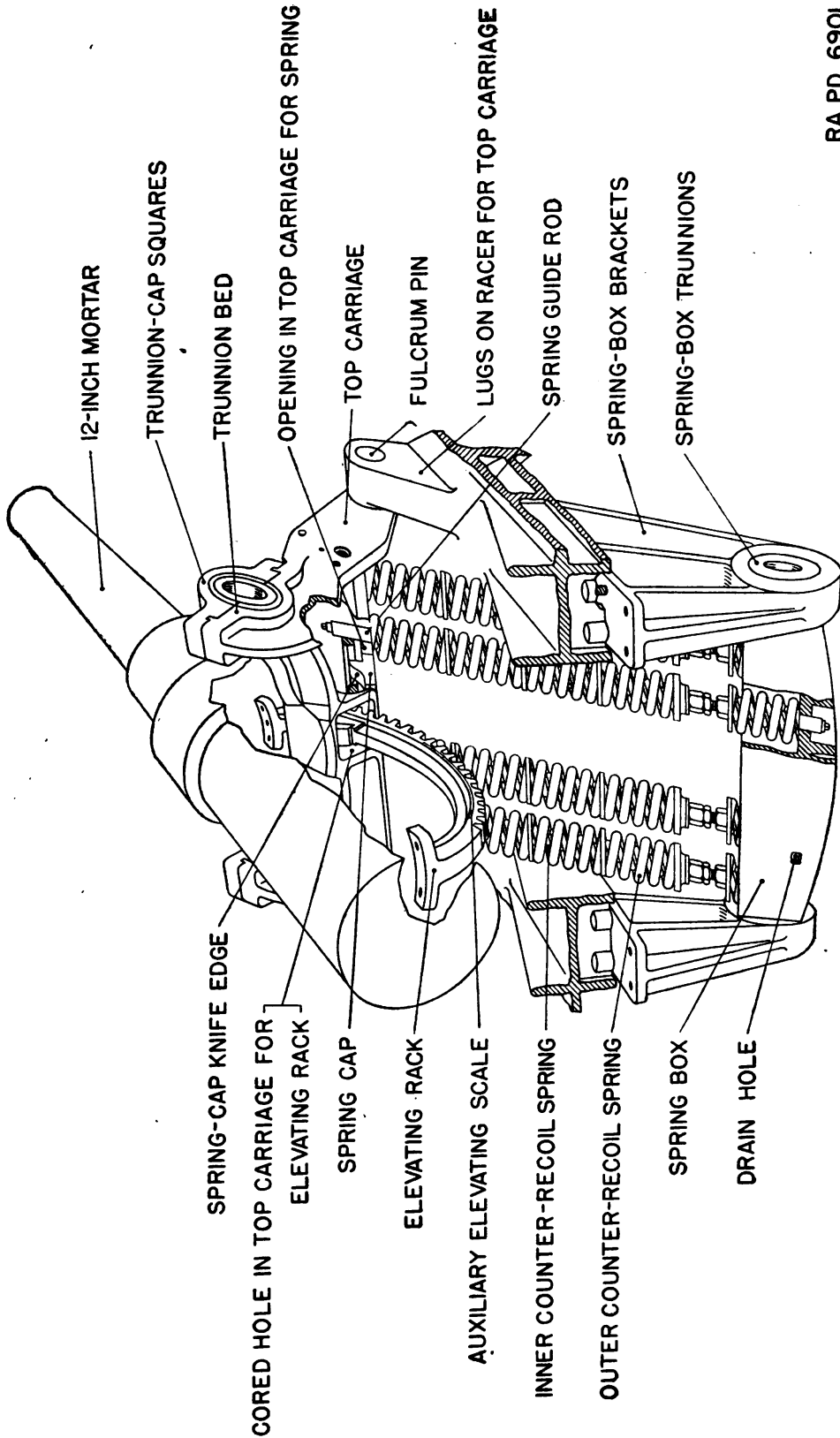
g. Circuit breaker.—The bronze circuit breaker consists of two principal pieces which are brought together when the breechblock is rotated to its locked position. A plunger working under the pressure of a spring serves to make electric contact between the two pieces. Since the piece is used as an electrical ground, both parts of the circuit breaker must be insulated from the piece.

SECTION III

DESCRIPTION OF CARRIAGE

	Paragraph
General.....	7
Recoil mechanism.....	8
Counterrecoil mechanism.....	9
Elevating mechanism.....	10
Traversing mechanism.....	11
Azimuth circle and pointer.....	12
Lanyard attachment.....	13
Electrical equipment.....	14

7. General.—*a.* The mortar carriage consists of a base ring bolted rigidly to the concrete emplacement and of a mortar-supporting structure which rests on the base ring and is capable of moving in azimuth upon it (figs. 11 and 12). The base of the carriage consists of the base ring, traversing rollers, and the racer. The top surface of the



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FIGURE 11.—12-inch mortar carriage M1896MILL.

base ring forms the lower roller path for the traversing rollers and the lower surface of the racer forms the upper roller path. The racer is the principal part of the base since it carries all the moving parts of the carriage except the traversing roller system. On the upper surface of the racer are two large lugs in which the top carriage is mounted (fig. 11). The racer has two ribs, corresponding to the side frames of other carriages, which provide bearings for the trunnions of the recoil cylinders. The lugs and ribs distinguish this carriage from other mortar carriages. Two racer clips are provided to prevent the racer from being lifted off the traversing rollers by the firing shock.

b. The upper part of the carriage consists of the top carriage, recoil mechanism, counterrecoil mechanism, elevating mechanism, traversing mechanism, elevation quadrant, lanyard attachment, and electrical equipment.

c. The top carriage (fig. 11) mounts the mortar on the racer structure. The lower end of the top carriage is held to the racer by fulcrum pins so that during recoil and counterrecoil the top carriage will pivot. Recoil cylinders are provided to check the recoil of the mortar, and counterrecoil springs to return the mortar to battery. An elevation lock holds the mortar horizontal while loading, an elevation clamp holds the piece at the desired elevation, and a traversing brake holds the piece at the proper azimuth. Later models of the M1896MIII carriage have no traversing brake.

8. Recoil mechanism.—*a. Cylinders.*—The recoil of the piece is checked by means of two hydraulic cylinders and by the resistance from the compression of the counterrecoil springs. The recoil cylinders (fig. 14) are attached to the racer between the side frame ribs by trunnions on the cylinder. When assembled, the lower ends of these cylinders extend through the racer. Each cylinder is fitted with a piston rod which works through stuffing boxes in both ends of the cylinder. Each stuffing box contains hydraulic packing which is held in place by a gland and follower. The seats for the packing in the cylinders and also the glands are beveled slightly so that when the follower is screwed against the gland the packing is pressed firmly against the outside surface of the piston rod. This prevents the oil from escaping when the mortar recoils or counterrecoils. The upper ends of the piston rods terminate in cross heads, through which the crank pins act to move the piston rods. The crank pins are extensions of the trunnions which pivot in the upper ends of the top carriage side arms.

b. Pistons.—When the mortar recoils the pistons move down, oil moving past the piston through the throttling grooves. Near the end of the piston stroke the throttling grooves (fig. 14) become smaller and at the end of the stroke they taper to nothing. The oil pressure on

the lower side of the pistons gradually transfers the force of the recoiling parts to the recoil cylinder and thus to the racer. The purpose of the oil in the cylinders is to prevent a shock to the carriage both during recoil and during counterrecoil. The resistance which the oil offers to the movement of the pistons through the cylinders during recoil takes up that part of the energy of recoil not absorbed by the counterrecoil springs.

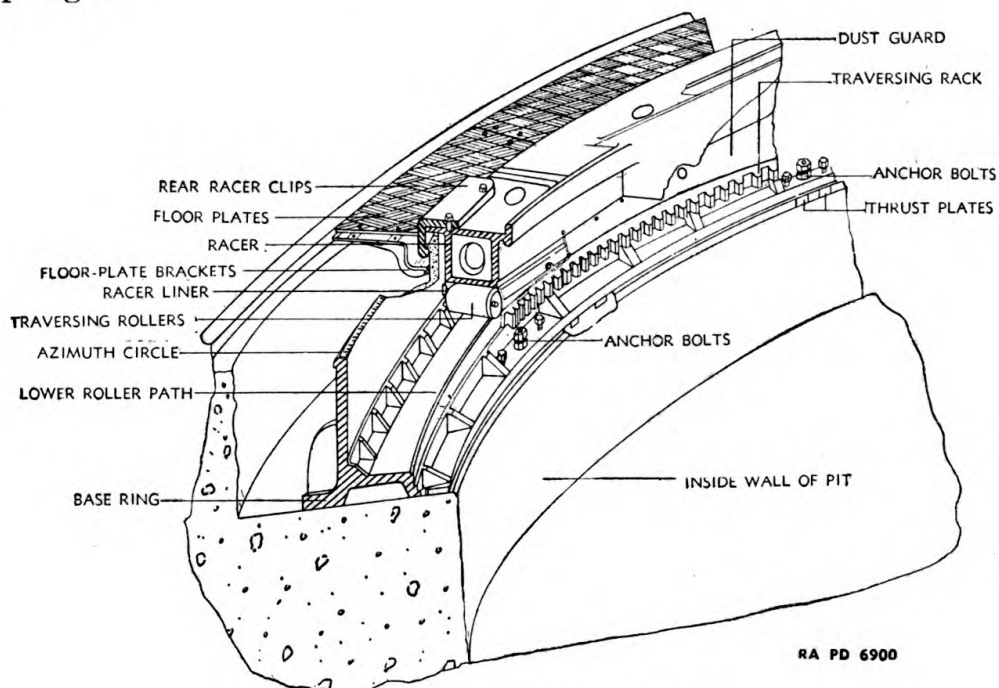


FIGURE 12.—Base ring and racer assembly.

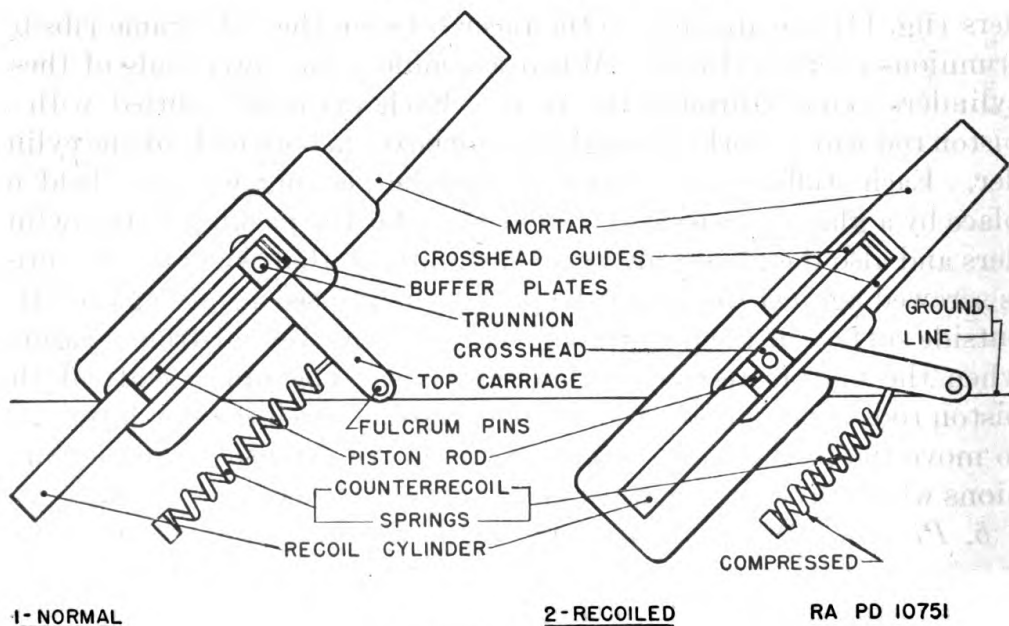


FIGURE 13.—Recoil.

c. *Counterrecoil buffers*.—(1) To prevent the shock to the carriage by reason of the sudden expansion of the springs returning the mortar to battery, a buffer is included in each cylinder. This consists of a recess cut in the lower part of the cylinder head, called the female part of the buffer, and a corresponding projection on the piston rod, called the male part of the buffer. During counterrecoil the piston in moving upward forces the oil into the recess in the cylinder head, and when the projection on the piston rod reaches the recess it can only enter by forcing oil out of the recess through the clearance between the walls of the male and female parts of the buffer. The oil left in the

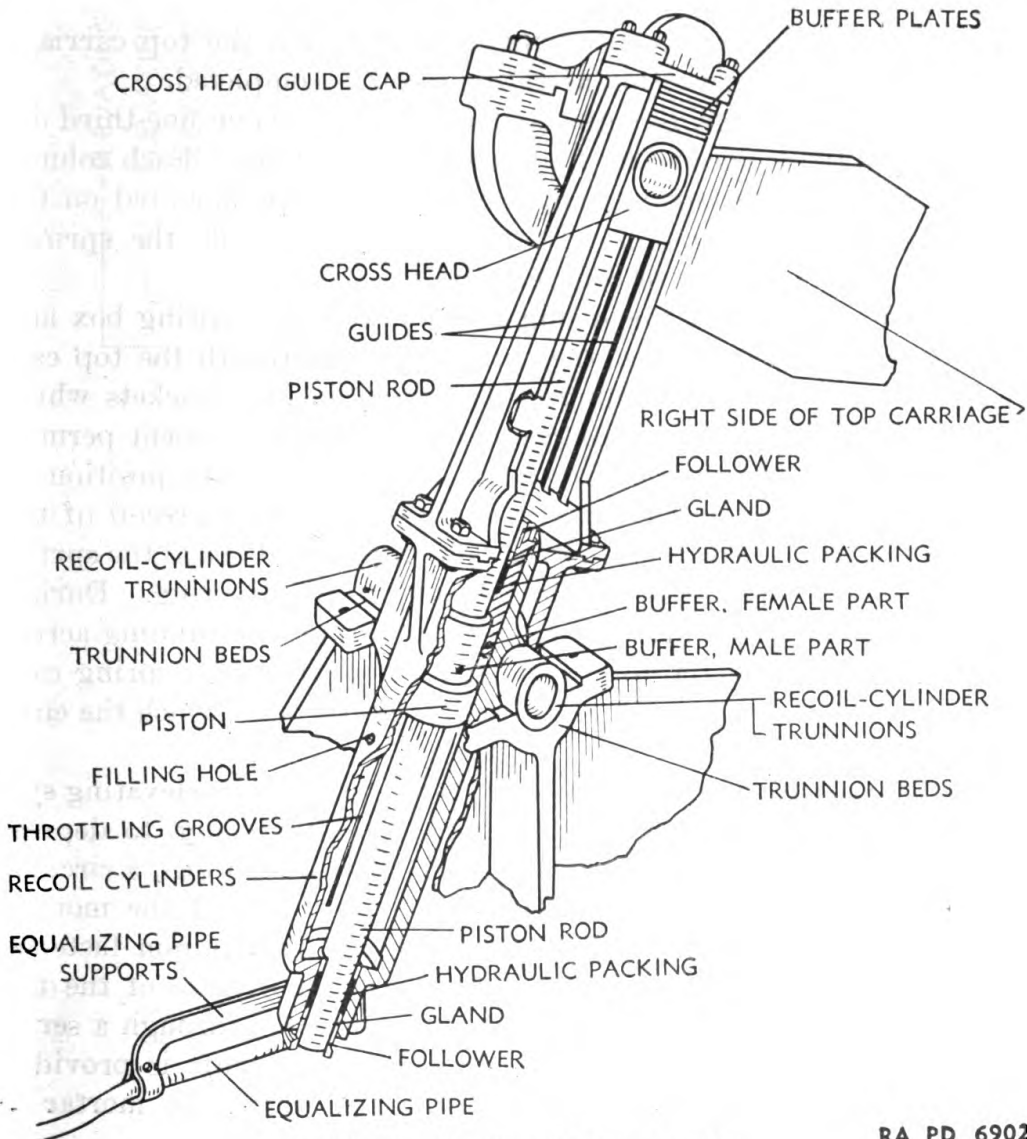


FIGURE 14.—Recoil mechanism assembly.

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recess acts as a cushion, gradually checking the return of the piece into battery.

(2) Buffer plates between the cross-head guide cap and the upper end of the cross head serve as an additional precaution against shock when the mortar is returning to firing position.

d. Equalizing pipe.—The lower ends of the hydraulic cylinders are connected by an equalizing pipe. This equalizes the quantity of oil in each cylinder, so that when the mortar is fired there will be equal pressure and equal resistance in both cylinders. The emptying coupling, located in the equalizing pipeline, is for draining the recoil oil.

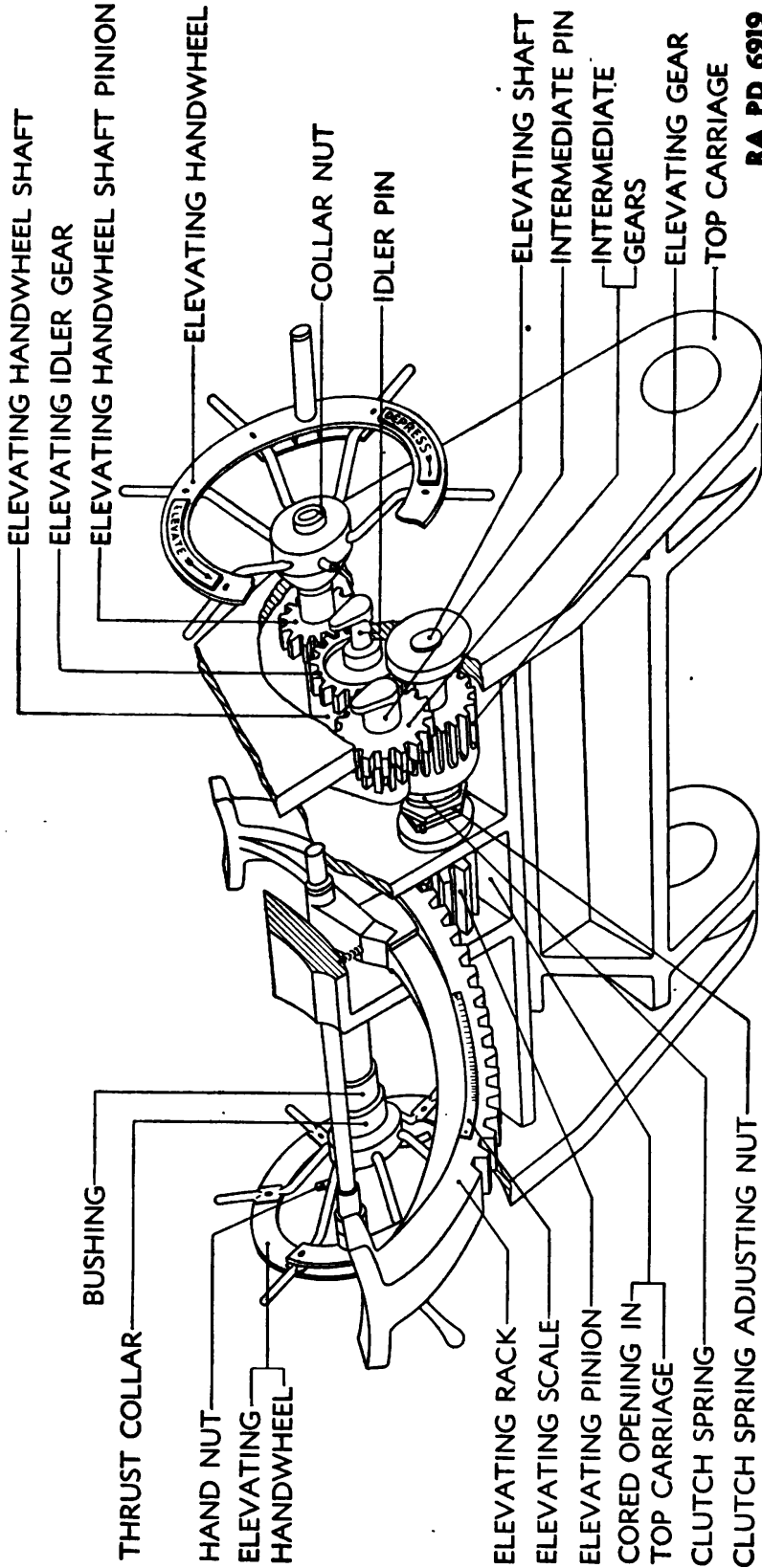
9. Counterrecoil mechanism.—*a.* The upper end of the top carriage moves downward during recoil of the mortar. This movement compresses the counterrecoil springs which return the top carriage and mortar to firing position after the recoil is completed.

b. The top carriage is supported at a point about one-third its length from the lower end by four columns of springs. Each column consists of five outer springs and five inner springs mounted on the spring guide rods (fig. 11). These rods serve to hold the springs in position during recoil or counterrecoil.

c. The lower ends of the spring columns rest in a spring box and the upper ends bear against the spring cap underneath the top carriage. The spring box is hung by trunnions in two brackets which are bolted to the under side of the racer. This arrangement permits the spring box to tip either backward or forward as the position of the spring columns changes due to the recoil or counterrecoil of the piece. The spring cap performs the same function above as the spring box does below. This cap is made with a knife-edge bearing. During recoil and counterrecoil this bearing rocks in a groove running across the lower surface of the top carriage. The spring box, spring cap, and top carriage are each provided with holes through which the ends of the spring rods pass freely.

10. Elevating mechanism.—*a.* The purpose of the elevating system is to elevate the mortar for firing and, after firing, to depress it to a horizontal position for loading. To accomplish this, a circular elevating rack (fig. 11) is bolted to the under part of the mortar. This rack is provided with teeth which engage in a pinion fastened to a heavy elevating shaft, located on the under surface of the top carriage (fig. 15). The elevating shaft is connected through a series of gears to the elevating handwheel shaft. This shaft is provided with a handwheel at each end by means of which the mortar is elevated and depressed.

b. When the mortar is elevated to the desired firing angle, it is held in place by means of a hand nut on the left end of the elevating

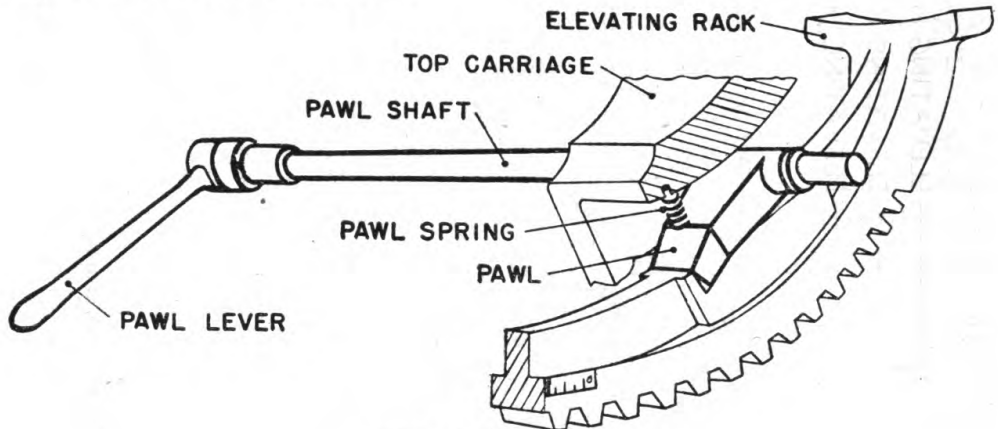


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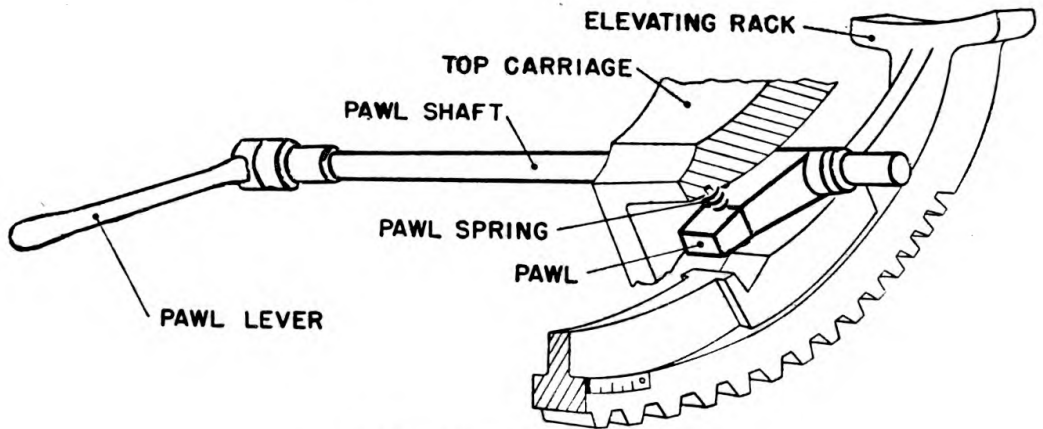
FIGURE 15.—Elevating mechanism.

handwheel shaft. The nut locks the shaft in position by pressing a thrust collar against a bushing located in the web of the top carriage. The handnut is provided with handles to facilitate locking the shaft in position.

c. To hold the mortar in a horizontal position for loading and to insure against accidental elevation of the mortar when the breech-block is thrown open, an elevation locking device (fig. 16) is provided on the left side of the top carriage. The spring forces the pawl downward into a notch in the elevating rack which locks the mortar in position when horizontal.



① Elevating lock engaged.



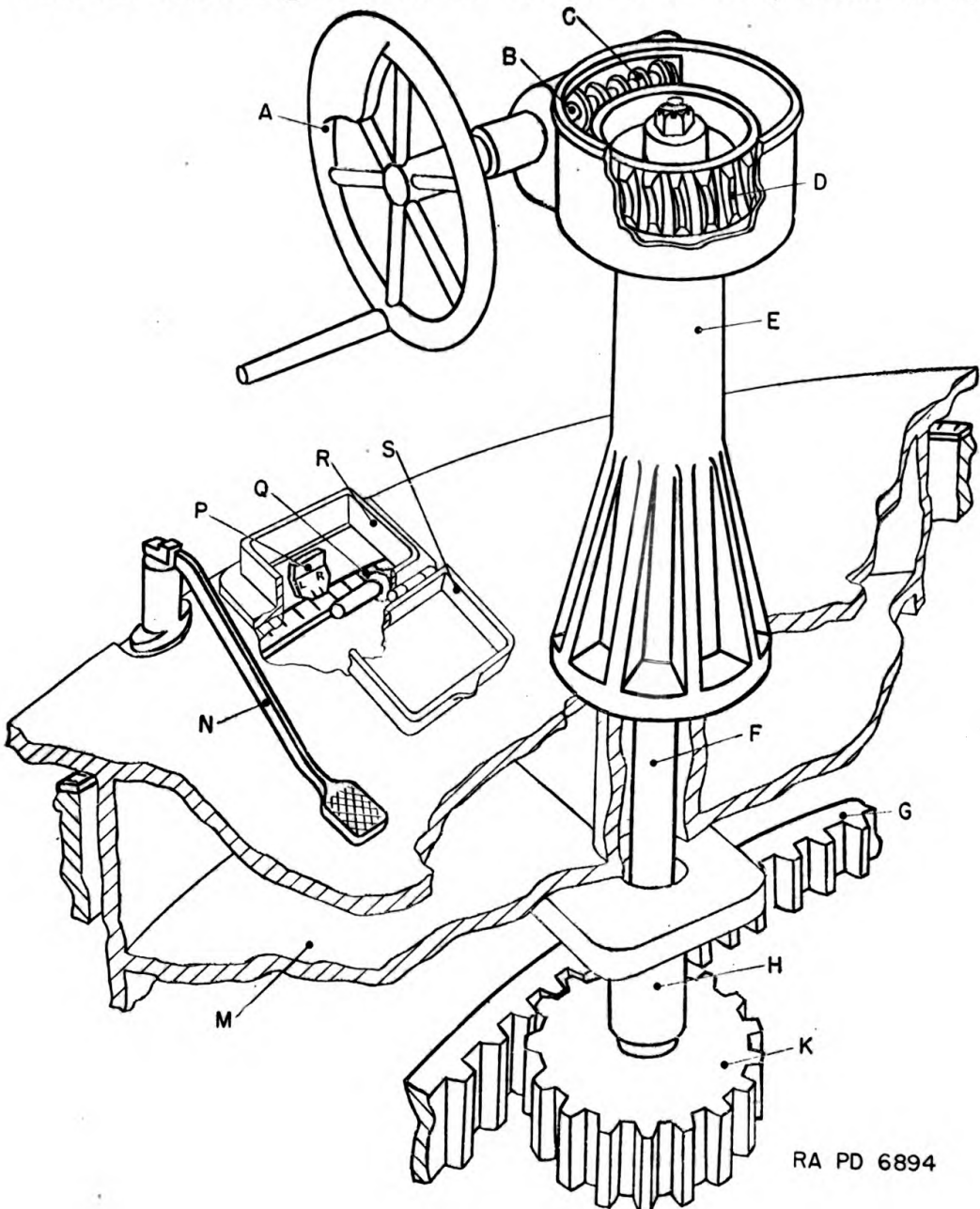
② Elevating lock disengaged.

FIGURE 16.—Elevation locking device.

d. On each side of the elevating rack there is an elevation scale graduated in degrees. A scale pointer is attached to the top carriage on each side.

11. Traversing mechanism.—a. The traversing mechanism (fig. 17) consists of the circular traversing rack attached to the inside of the base ring and the vertical traversing shaft through the racer.

The horizontal worm on the traversing handwheel shaft meshes with the worm wheel on the upper end of the traversing shaft. The traversing pinion on the lower end of the traversing shaft meshes with the traversing rack on the racer. The worm, worm shaft,



RA PD 6894

- | | |
|-------------------------------|-------------------------------|
| A. Traversing handwheel. | K. Traversing pinion. |
| B. Traversing worm shaft. | M. Racer. |
| C. Traversing worm. | N. Traversing brake assembly. |
| D. Worm wheel. | P. Azimuth pointer. |
| E. Pedestal. | Q. Azimuth circle. |
| F. Vertical traversing shaft. | R. Coaming. |
| G. Traversing rack. | S. Lid. |
| H. Traversing shaft bracket. | |

FIGURE 17.—Traversing mechanism.

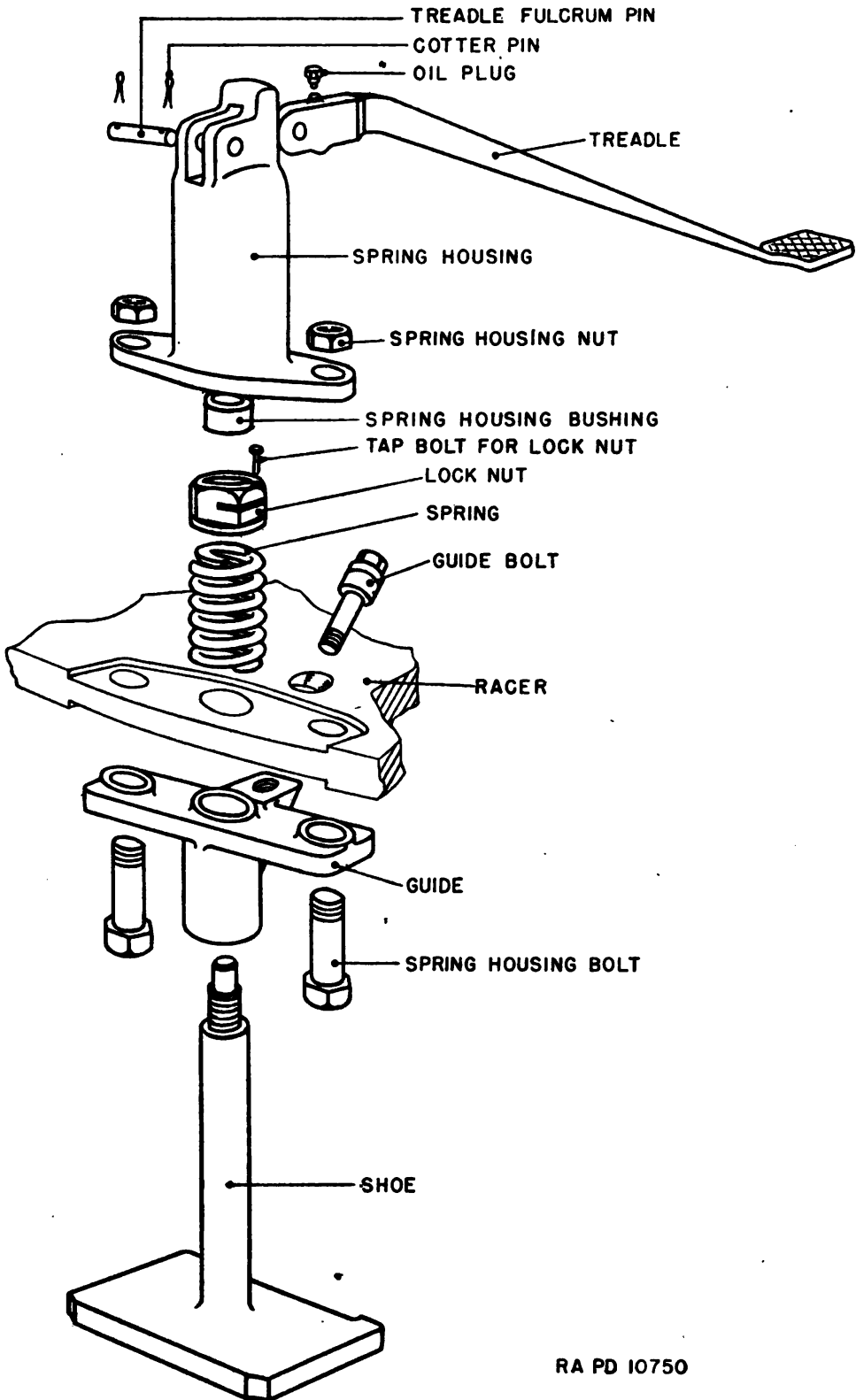
worm wheel, and the part of the vertical shaft above the racer are encased in a pedestal which has oil and drain holes so arranged that the worm and the rim of the worm wheel run in oil.

b. In order to hold the carriage in position so that it will not move after being set in azimuth, a traversing brake is provided. This brake (fig. 18) is operated from the top side of the racer by means of a treadle lever located near the azimuth pointer and traversing pedestal. The brake is attached to the racer and a heavy spring imposes a drag on the base ring, locking the racer to the ring. The brake is released by depressing the brake shoe by means of the treadle lever.

12. Azimuth circle and pointer.—The azimuth circle (figs. 12 and 17) consists of a flat brass ring fastened to the vertical flange of the base ring. It is graduated in degrees and numbered at each graduation. The azimuth pointer, fastened to the racer, is visible through a hole in the racer near the traversing pedestal, enabling the operator of the traversing wheel to stop at any desired point on the azimuth circle. An electric light is provided for illuminating the scale and pointer. A lid and coaming protect the lamp and pointer from injury when not in use.

13. Lanyard attachment.—a. The lanyard (fig. 19), used to fire when a friction primer is employed, consists of a short manila rope which passes down through a hole in the racer at the rear of the central opening on the right-hand side. It passes beneath the racer through the lanyard pulley and up through the racer on the left-hand side and terminates in the button (D, fig. 19). The lanyard passes up through the right-hand hole in the racer through the safety lanyard device to the firing mechanism on the breech of the mortar.

b. The lanyard safety device prevents accidental firing of the mortar by the lanyard before the minimum firing elevation has been reached. When the safety device is engaged, a pull on the lanyard would not reach the firing mechanism but would be arrested by the safety device. After the mortar reaches the minimum elevation, the safety device is automatically released and any pull on the lanyard can then be transmitted directly to the firing mechanism. The safety device, located at the right side of the breech, consists of a hinged dog and a bridle ring catch. The bridle ring on the lanyard is secured to the bridle ring catch, and the hook of the lanyard is attached to the firing mechanism. When the mortar is elevated to the minimum firing angle, the safety device automatically opens, releasing the lanyard from the bridle ring catch. Because of the hinge feature of the dog, the mortar can be returned to loading position without interference with the bridle ring catch.

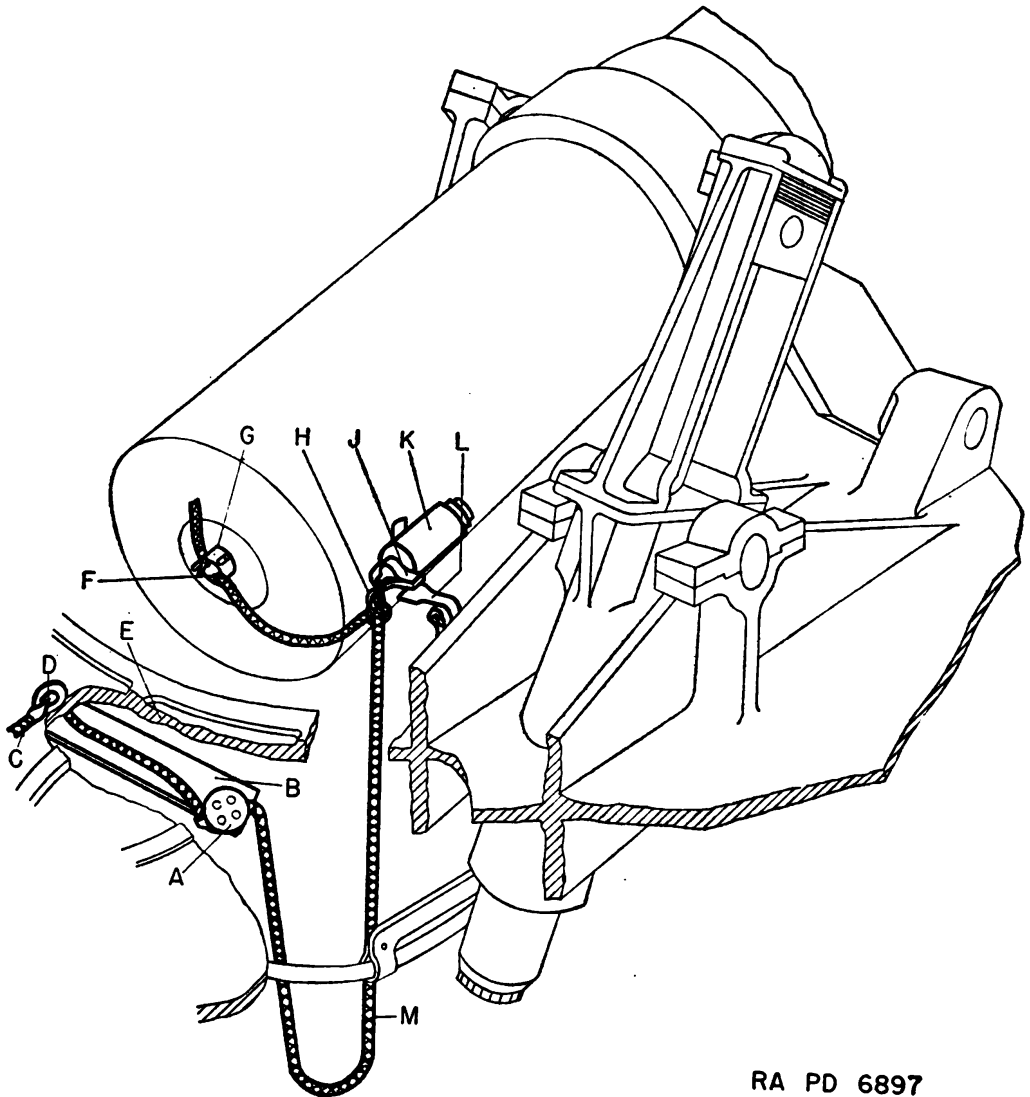


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FIGURE 18.—Traversing brake.

14. Electrical equipment.—The electrical equipment on this carriage consists of the lighting and firing circuits (fig. 20).

a. Lighting circuit.—Power for the lighting circuit is supplied by the mains of the emplacement through the lighting circuit receptacle



RA PD 6897

A. Lanyard pulley.
B. Pulley bracket.
C. Long lanyard.
D. Lanyard button.
E. Hole in racer.
F. Lanyard hook.

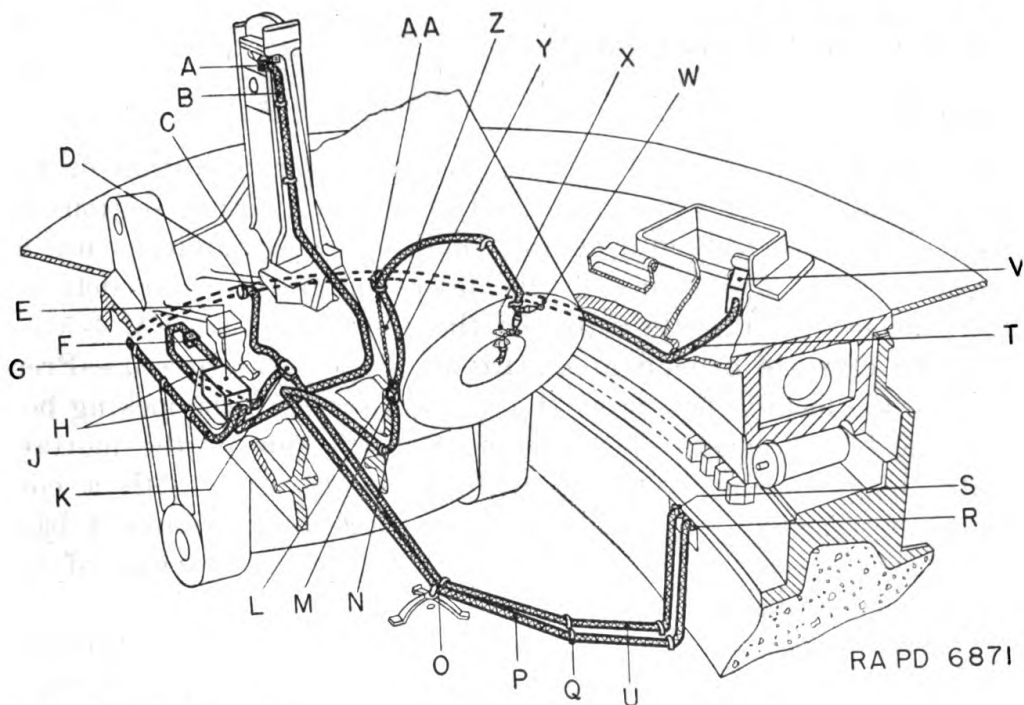
G. Firing mechanism.
H. Bridle ring.
J. Bridle-ring catch.
K. Lanyard housing.
L. Hinged dog.
M. Short lanyard.

FIGURE 19.—Lanyard safety device.

box. This receptacle box is bolted to the under side of the base ring. Cables connect the receptacle box to the junction box, and the junction box to the following outlets: the azimuth lamp, the quadrant lamp, and the plug box. The plug box is used as a connection for a portable

lamp. The circuit from the junction box to the two lamps leads through the lighting switch and resistance box. The resistance box furnishes the means of reducing the 110 or 220 volts of the power main to the 16 volts required at the lamp terminals.

b. Firing circuit.—Power for the firing circuit is supplied to the watertight firing circuit receptacle box. This power is brought through



RAPD 6871

- | | |
|---|---|
| A. Quadrant lamp bracket. | O. Double pulley. |
| B. Cable to quadrant lamp. | P. Firing-circuit cable. |
| C. Circuit for portable lamp. | Q. Cable hooks. |
| D. Engineer's plug box. | R. Firing-circuit receptacle box inlet. |
| E. Resistance box. | S. Lighting-circuit receptacle box inlet. |
| F. Watertight switch. | T. Cable to azimuth pointer lamp. |
| G. Cable to resistance. | U. Lighting-circuit cable. |
| H. Circuit for azimuth and quadrant lamp. | V. Azimuth pointer receptacle box. |
| J. Cable to quadrant lamp. | W. Ground on mortar. |
| K. Junction box. | X. Circuit breaker contact. |
| L. Safety firing plug. | Y. Flexible cable (short). |
| M. Receptacle box (firing plug). | Z. Brass sash chain. |
| N. Firing-circuit cable. | AA. Bolt, snap, ring. |

FIGURE 20.—Electrical equipment.

a hand-operated magneto attached to a bracket on the wall of the emplacement. A cable from the magneto furnishes power to the firing mechanism and the primer. One side of this circuit is grounded to the mortar; the other side is insulated from the mortar and connected to the firing mechanism. The firing circuit is closed by the electric primer, which is fired when current passes between the insulated cable to the grounded mortar.

SECTION IV

OPERATION

	Paragraph
General-----	15
To operate breech mechanism-----	16
To elevate or depress mortar-----	17
To traverse mortar-----	18
Points to be observed before firing-----	19
Points to be observed during firing-----	20
To load mortar-----	21
To fire mortar-----	22

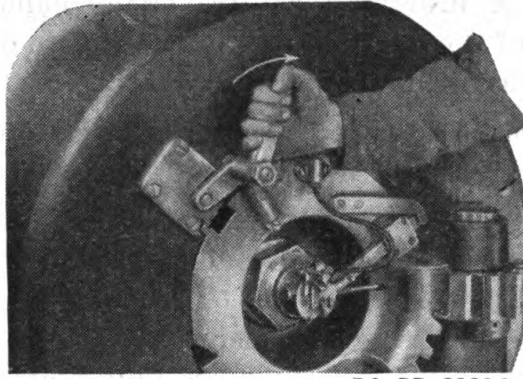
15. General.—Only information necessary for operation of the mortar and carriage is included in this section. Other sections of this manual cover preparation and handling of ammunition, use of accessories, and operation of subcaliber equipment. For detailed information regarding the duties of the gun section, see FM 4-55.

16. To operate breech mechanism.—*a. To open breech.*—Press down on the locking bolt lever (fig. 21①) to remove the locking bolt from the breechblock. Then (facing the left side of the mortar) rotate the operating crank in a clockwise direction with a continuous movement. This will rotate the breechblock, move it back out of the breech recess onto the tray, and swing it clear of the mortar for loading.

b. To close breech.—Facing the left side of the mortar turn the operating crank in a counterclockwise direction. Continue turning the operating crank until the breechblock is locked in place by the locking bolt.

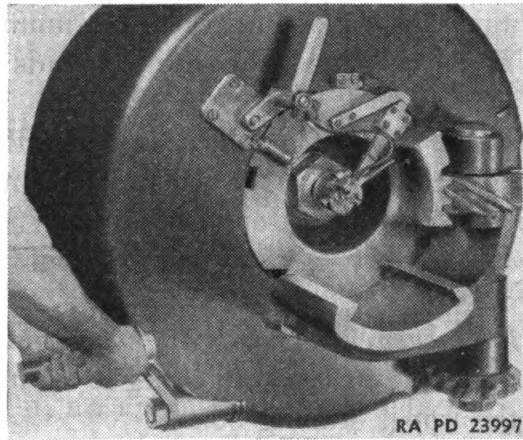
17. To elevate or depress mortar.—*a. To elevate.*—Pull back on the pawl lever (fig. 16) to disengage the pawl from its notch in the elevating rack and free the mortar for elevating. Rotate the handwheels in the direction indicated on the direction plates. When the mortar is elevated to the desired firing angle, lock the elevating shaft in position by means of the hand nut on the left end of the shaft.

b. To depress mortar to loading position.—Release the hand nut and depress the mortar by rotating the handwheel until the pawl of the elevating locking device engages the rack to lock the mortar in the horizontal position. Locking insures against accidental elevation of the mortar when the breechblock is opened.



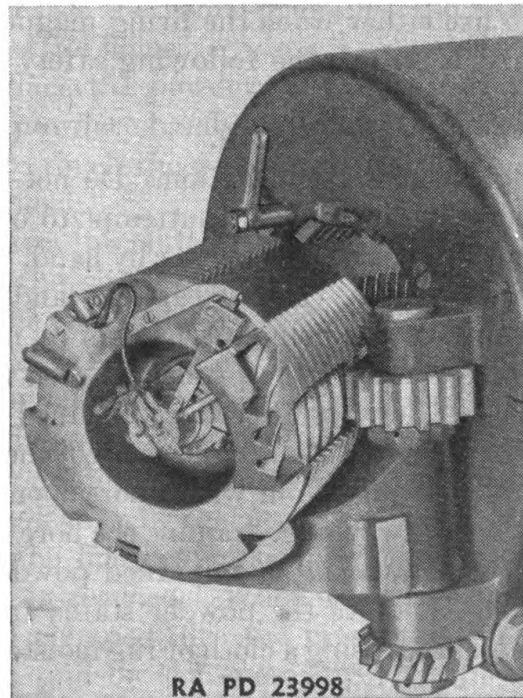
RA PD 23996

① Unlocking.



RA PD 23997

② Rotating.



RA PD 23998

③ Open.

FIGURE 21.—Operating breech.

18. To traverse mortar.—The traversing handwheel is located on the right side of the mortar. A direction plate on the handwheel indicates which way it should be turned to traverse the mortar.

NOTE.—If the carriage is equipped with a traversing brake (figs. 17 and 18), release it for traversing by depressing the foot pedal.

19. Points to be observed before firing.—*a. Electrical contacts.*—Before firing, all electrical contacts should be examined to see that the firing circuit is complete. This may be accomplished by using a test lamp or by firing a primer.

b. Pressure plug seats.—The pressure plug seats in the obturator head should be closed either by the dummy plugs or pressure gages. A copper washer must be in place beneath the dummy plugs or pressure gages during firing to protect the screw threads from the powder gases.

c. Obturator spindle nut.—The obturator spindle nut should always be screwed up so that there is sufficient friction to make a slight effort necessary to turn the obturator in its seat.

d. Gas-check pad.—Apply SAE 10 engine oil to the gas-check pad and rub in well.

e. Preparation for measuring length of recoil.—Make several turns with fine twine around the piston rod, tying it tightly just where the piston rod enters the upper stuffing box.

20. Points to be observed during firing.—*a. Precautions.*—If the mortar fails to fire either when the firing magneto lever is raised or when the lanyard is pulled, the following safety precautions must be observed:

(1) Stand clear of the path of recoil.

(2) Keep the mortar at firing elevation. Do not depress the piece.

(3) Do not under any circumstances attempt to open the breach.

(4) Do not attempt to remove the primer by hand. Use the butterfly net provided for this purpose. Taking care to stand clear of the path of recoil, raise the slide of the firing mechanism by means of the hook at the end of the pole and eject the primer. Catch the primer in the net and examine it. Follow the procedure outlined in paragraph 23.

b. Powder chamber.—After each round is fired, the powder chamber of the mortar should be swabbed out with a bore sponge saturated with cleaning solution. After swabbing, examine the bore of the mortar and remove any particles of wadding or unburned powder remaining.

c. Obturator head.—Remove the powder stains from the obturator head after each round fired, using a cloth or rag moistened with cleaning solution.

d. Gas-check pad.—The gas-check pad should be oiled frequently enough to keep it compressible. A pad of proper resiliency will yield slightly under heavy pressure from the thumbs.

e. To measure recoil.—Normally the length of recoil will be checked after each round is fired. The height of the twine (par 19e) above the stuffing box after firing will indicate the length of recoil. The normal length of recoil is 23 inches. The maximum safe length of recoil is 24 inches. If the length of recoil reaches the maximum, the cylinders should be filled to the level of the filling holes and a check should be made to insure that the mortar is returning fully into battery, with the counterrecoil springs holding the cross head securely against the buffers. If the mortar then recoils over 24 inches, it indicates a dangerous condition of the matériel. Stop firing. Notify ordnance maintenance personnel. The maximum possible recoil is 24 $\frac{1}{4}$ inches. However, if this recoil should occur, damage to the carriage would likely result.

f. Firing by electric primer.—When firing by electric primer, do not connect the safety firing plug (L, fig. 20) until the mortar is elevated past 45°. Disconnect the plug before depressing the mortar.

21. To load mortar.—*a. Projectile.*—With the mortar at the proper loading angle (0°), open the breech. Run the shot truck, with the projectile on it, up against the breech face of the mortar, where it is brought to a gradual stop by the buffer ram. Set the brakes on the shot truck. Place the rammer against the base of the projectile and ram the projectile home.

b. Powder.—Place the powder on the tray of the shot truck and push it into the powder chamber by hand a distance that will allow the breechblock to touch the powder charge. Remove the shot truck. Close the breechblock.

c. Primer.—Raise the slide of the firing mechanism and insert the primer. Lower the slide, making sure that the lip of the ejector engages behind the rim of the primer. The mortar is now loaded.

22. To fire mortar.—There are two methods of firing the mortar: electrically and by lanyard. The electrical method of using the firing magneto to set off an electric primer is preferred.

a. To fire mortar by firing magneto.—Insert an electric primer in the firing mechanism. As the mortar is being elevated, insert the firing plug into the firing plug box. This cannot be done until an elevation of 45° is reached. When the elevation and azimuth are properly set and clamped, fire the mortar at the proper time by a moderately quick pull on the operating lever of the firing magneto. The latch which holds the lever against accidental operation is released

by gripping the lever handle. After the lever is released it returns to its normal position by its own weight assisted by a lever spring.

b. To fire mortar by lanyard.—Attach the bridle ring on the short lanyard to the bridle ring catch. After the mortar has been elevated beyond 43°, attach the hook of the short lanyard to the eye on the firing leaf. Then fasten the long lanyard to the eye of the stopper button in the racer. When the elevation and azimuth have been set and clamped, the mortar should be fired at the proper time by a quick, strong pull (not a jerk) from a position directly in rear of the piece.

SECTION V

MALFUNCTION AND CORRECTION

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Mortar.....	23
Carriage.....	24

23. Mortar.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
<i>a. Misfire (fails to fire) with electric primer. If the primer is definitely heard to fire, proceed immediately as in (2) below, and if the primer is definitely not heard to fire proceed as in (3) below.</i>	<i>a. Hangfire, defective primer, interrupted electrical circuit, powder failed to ignite, etc.</i>	<i>a. Keep the mortar at firing elevation. Stand clear of the path of recoil. Do not open the breech.</i>
(1) Whether the primer has fired, uncertain.	(1) If there is uncertainty as to whether the primer has fired, any of the above causes might be responsible for the misfire and the following determination should be made.	(1) After three attempts to fire, eject the primer, using the butterfly net (par. 20). Examine the ejected primer. If examination shows that the primer has fired, either a hangfire has occurred or the powder charge has failed to ignite. Proceed as in (2) below. If examination

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
		shows that the primer has not fired, either the primer was defective or there is a broken electric circuit. To correct, proceed as in (3) below.
(2) Primer heard to fire.	(2) Failure of powder charge to ignite, or hangfire (slow ignition).	(2) <i>If the primer fires and the piece fails to fire, leave the mortar in the elevated position and keep in a clear field of fire for 10 minutes. After this, insert another primer in the firing mechanism and resume firing.</i>
(3) Primer not heard to fire.	(3) (a) Broken electric circuit or defective primer.	(3) (a) Repeat the attempt to fire with two additional primers. If either of these successive attempts results in the firing of the primer, the preceding primers are defective and should be set aside. If all three primers fail to fire, there is probably an interruption in the electrical circuit, and the procedure in (b) below should be followed.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
	(b) Loose connections or contact. Firing circuit broken.	(b) Check the electrical system. Tighten loose connections or contacts. Replace broken wires. If the primer still does not fire notify ordnance maintenance personnel.
b. Misfire (fails to fire) with friction primer. If the primer is definitely heard to fire, proceed immediately as in (2) below; if the primer is definitely not heard to fire, proceed as in (3) below.	b. Hangfire, defective primer, powder failed to ignite, etc.	b. Keep the mortar at firing elevation. Stand clear of the path of recoil.
(1) Whether the primer has fired, uncertain.	(1) If there is uncertainty as to whether the primer has fired, any of the above causes might be responsible for the misfire and the following determination should be made.	(1) After three attempts to fire, eject the primer, using the butterfly net (par. 20). Examine the primer. If examination shows that the primer has fired, either the powder charge has failed to ignite or a hangfire has occurred. Follow procedure (2) below. If the primer has not fired, it is defective. Follow procedure (3) below.
(2) Primer heard to fire.	(2) Failure of powder charge to ignite, or hangfire (slow ignition).	(2) <i>If the primer fires and the piece fails to fire, leave the mortar</i>

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
		<i>in the elevated position and keep in a clear field of fire for 10 minutes. After this, insert another primer in the firing mechanism and resume firing.</i>
(3) Primer not heard to fire.	(3) Defective primer.	(3) Insert a new primer and set the defective one aside.
c. Seized breech-block.		c. Notify ordnance maintenance personnel.
d. Escape of gases.	d. Bruises on gas-check pad or torn covering. Burred or ruptured split rings.	d. Replace the damaged obturator parts.
e. Burred or corroded head on primer, or primer fails to be ejected.	e. Ruptured primer. Failure to ream primer seat.	e. Ream primer seat.
f. Broken or damaged parts of the firing and breech mechanisms.		f. Parts may be replaced by the using arm, if the facilities are available.

24. Carriage.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
a. Loose elevating rack.	a. The firing stresses are likely to cause the bolts to come loose.	a. Tighten the bolts.
b. Failure of motar to return fully into battery.	b. Counterrecoil springs out of adjustment.	b. (1) The counter-recoil springs are properly adjusted when, with the mortar loaded and at maximum firing elevation, the cross heads are held in contact with the buffer plate.

Malfunction

Cause

Correction

(2) To adjust, loosen the lock nuts on the spring rods. Tighten each adjusting nut a little at a time until the correct adjustment is obtained. Prevent the rods from turning by means of a wrench on the fixed nuts below the lock nuts. Occasionally during adjustment release the elevating lock and jar the mortar against the depression stop on the top carriage by means of the elevating hand-wheels. When the proper adjustment is obtained, tighten the lock nuts securely against the adjusting nuts.

SECTION VI

CARE AND PRESERVATION

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Disassembly and cleaning of firing mechanism.....	28
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Preparation for active season.....	30
Preparation for inactive season.....	31
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25. General.—*a.* Routine service of the mortar and carriage is described in this section. Servicing of the ammunition, accessories, and subcaliber equipment is covered in sections X, XI, and XII.

b. The matter of keeping all parts of the mortar and carriage in condition is of vital importance. Proper lubrication and care are absolutely necessary to obtain good performance.

c. All parts provided with oil holes or grease cups should be lubricated at the correct intervals. When carriages are in use for daily drills, a thorough lubrication twice a week should be sufficient for all but the most severely used parts. The recoil cylinders must be filled before firing is commenced. To fill the cylinders, remove the plugs in the filling holes and add light recoil oil until the oil comes up to the level of filling holes. Replace the plugs.

d. When the matériel is not in use, all covers furnished should be in place.

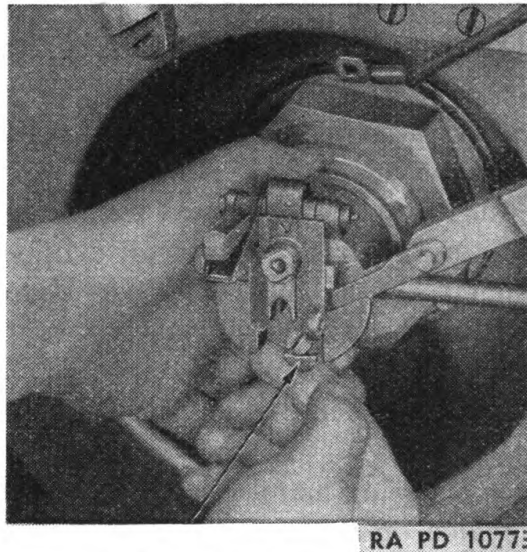
e. When the mortar is being manned continually, the firing mechanism should be assembled on the mortar and left assembled until the mortar is not manned. It should then be disassembled, put in the small box provided for it, and stored in the armament chest.

26. After firing.—*a. Bore.*—After firing, and while the mortar is still warm, the bore should be cleaned. Swab the bore with a solution of $\frac{1}{2}$ pound of soda ash or 1 pound of sal soda to each gallon of water. This solution should be warm when used. When all powder fouling has been removed, swab the bore with clear water. Then dry the bore, using the sponge covered with burlap or cleaning cloths. Oil the bore with engine oil, SAE 10 (for temperatures below 32° F.) or SAE 30 (for temperatures above 32° F.).

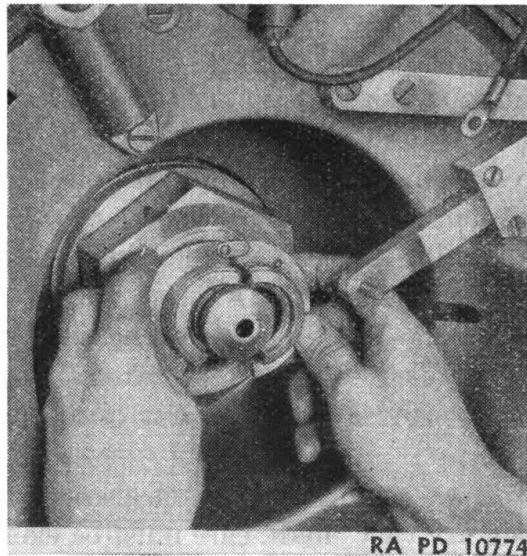
b. Breech mechanism.—The breech mechanism should be disassembled, cleaned, and oiled immediately after firing. This is especially important as no provision is made for oiling by means of oilers or oil channels.

c. Firing mechanism.—(1) Since the clearances between parts of the firing mechanism are very small, care must be exercised to keep the mechanism well oiled and free from rust and dirt. The mechanism should always be disassembled, cleaned, and oiled immediately after firing.

(2) Occasionally, during firing, residue works its way back, through the vent hole in the spindle, to the primer seat, causing the primer to seat improperly. After firing, this residue should be removed by reaming out the primer seat with the primer seat cleaning reamer which is carried in the firing mechanism box. At this time the vent hole in the spindle should also be cleaned out, using the flannel patches and vent cleaning rod provided.



① Unlatching firing mechanism.



② Removing hinged collar.

FIGURE 22.—Removing firing mechanism from breechblock.

27. Disassembly and cleaning of breech mechanism.—*a. Disassembly for cleaning.*—(1) With the breech mechanism closed and in the locked position remove the firing mechanism by drawing the hinged collar catch (fig. 22) to the rear, unscrewing the hinged collar from the housing, and pulling the firing mechanism off the obturator spindle.

(2) Remove the hinged collar from the obturator spindle.

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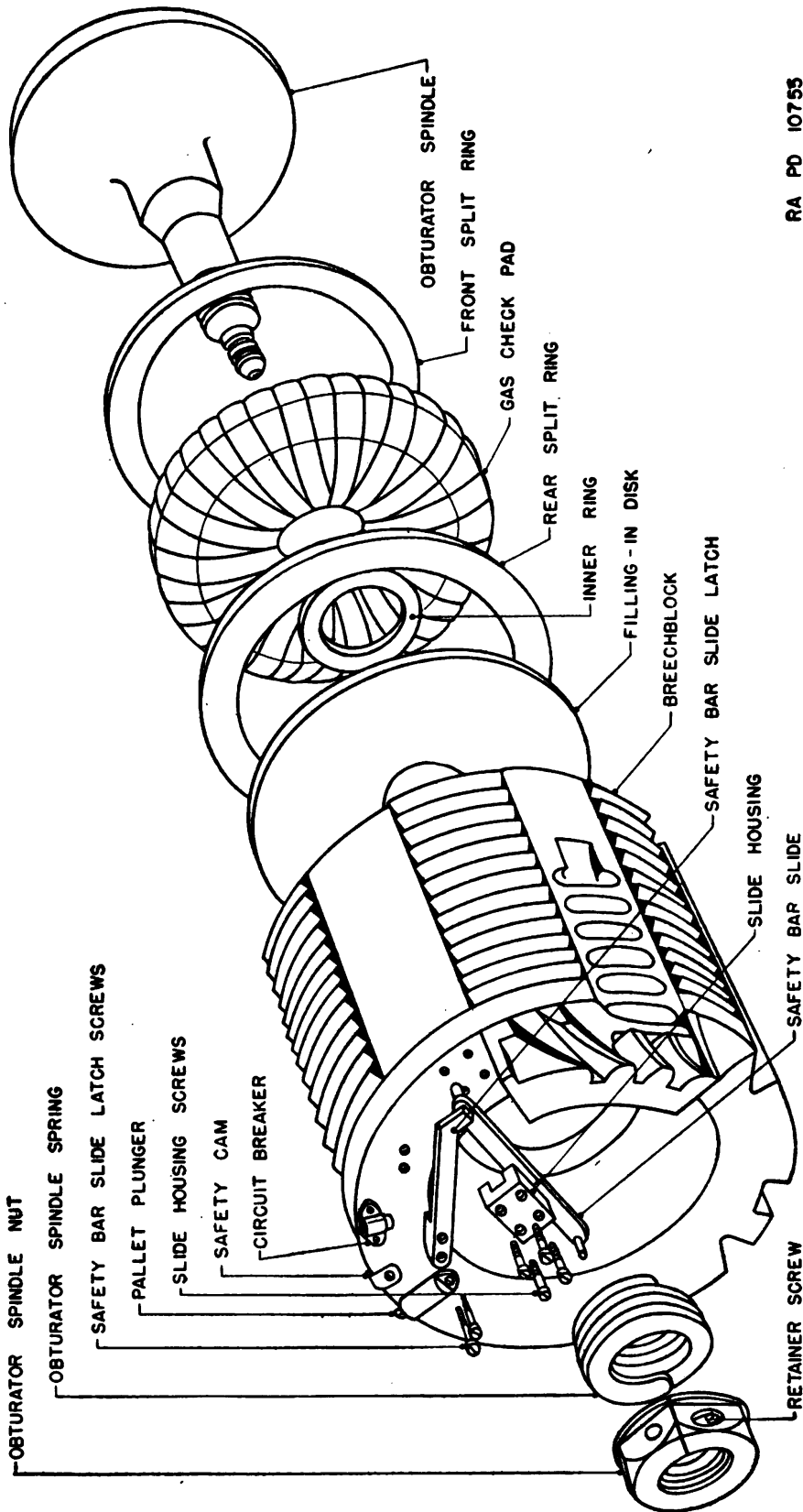
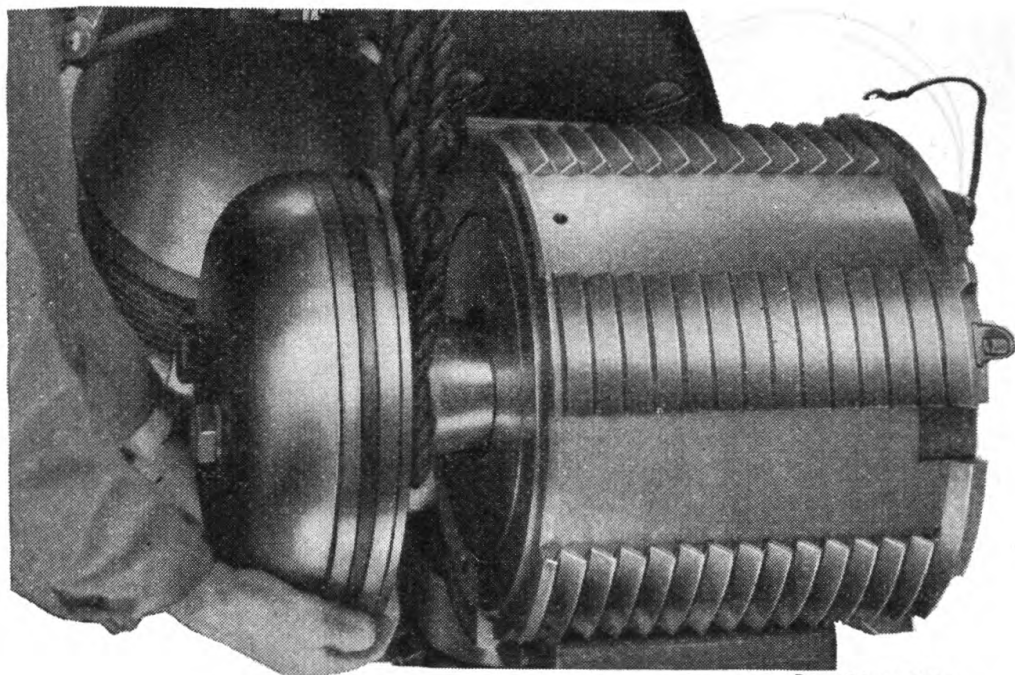


FIGURE 23.—Disassembled breechblock.



RA PD 10776

FIGURE 24.—Removing obturator.

(3) Disassemble the safety-bar slide housing (fig. 23) and safety-bar slide latch.

(4) Turn the operating crank until the breechblock is as far back on the tray as possible, so that the obturator spindle head will clear the breech recess.

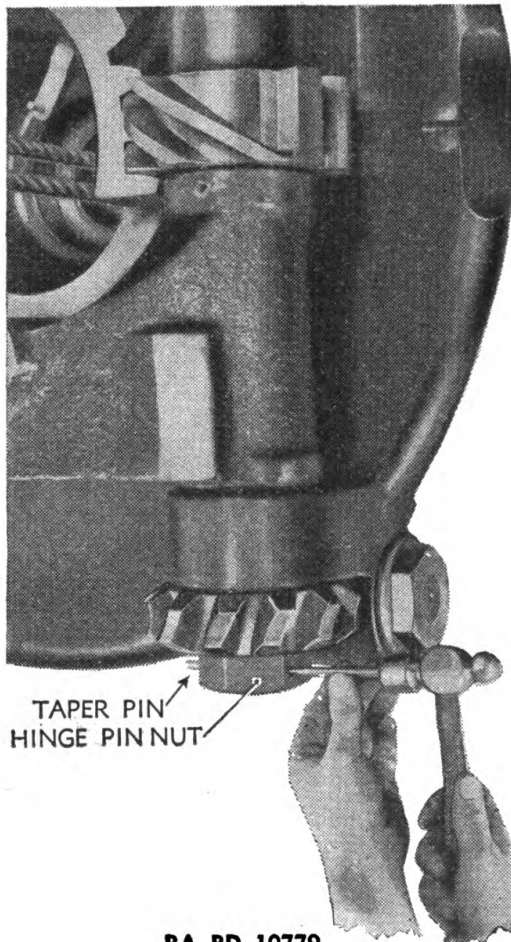
(5) Remove the obturator spindle nut and obturator spindle spring, and withdraw the obturator spindle from the breechblock.

(6) Remove the filling-in disk, split rings, and gas-check pad from the obturator spindle.

(7) Pass a loop of heavy rope through the obturator spindle hole of the breechblock as shown in figure 26① so that the end of the loop protrudes beyond the nose of the block. Pass a block of wood through the loop and pull the rope tight. Close the breech in the regular manner by means of the operating crank until the marking lines (fig. 28) on the hinge coincide with the lines on the compound gear and worm wheel. If the marking lines have been obscured, the point of rotation is just when the breechblock has been rotated so that the threads on the breechblock are out of mesh with the threads of the breech recess and the breechblock is just ready to start moving backward onto the tray.

(8) Keep the loop that has been passed through the obturator hole tight. Remove the hinge pin nut, first driving out the taper pin retaining the nut.

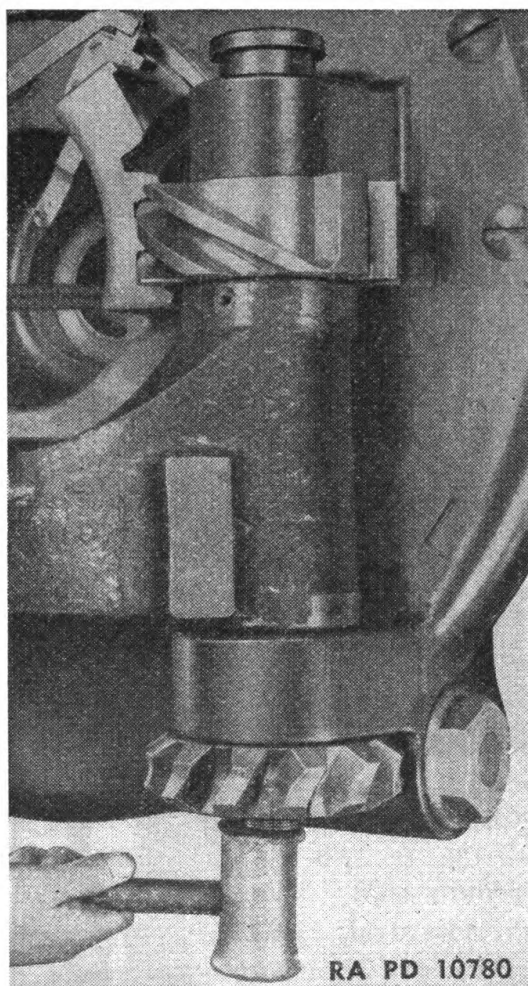
- (9) Drift out the hinge pin. (Use lead hammer and any heavy drift punch of smaller diameter than the hinge pin.)
- (10) Remove the worm wheel and compound gear.



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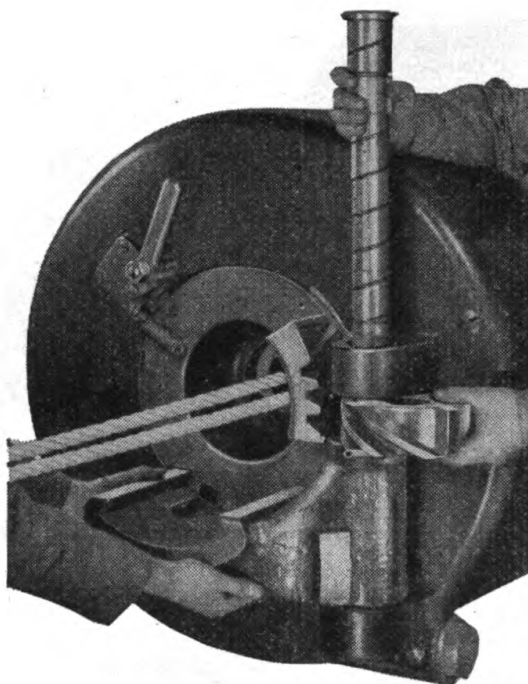
① Drifting out taper pin.

FIGURE 25.—Removing compound gear.



② Removing hinge pin.

FIGURE 25.—Removing compound gear—Continued.

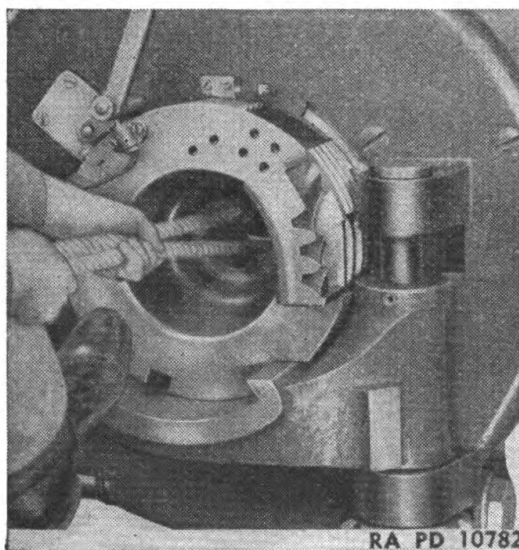


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③ Removing compound gear.

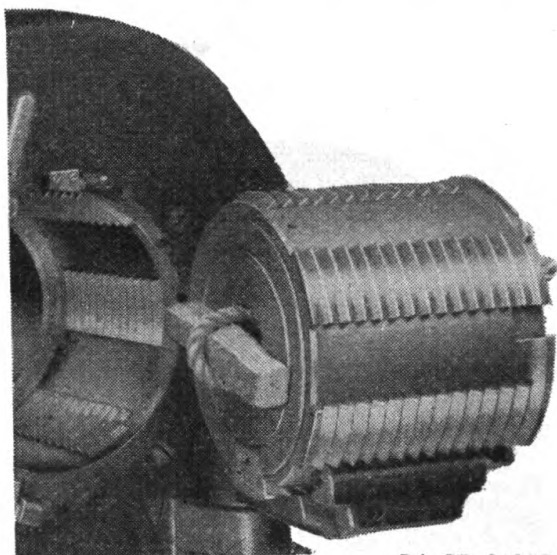
FIGURE 25.—Removing compound gear—Continued.



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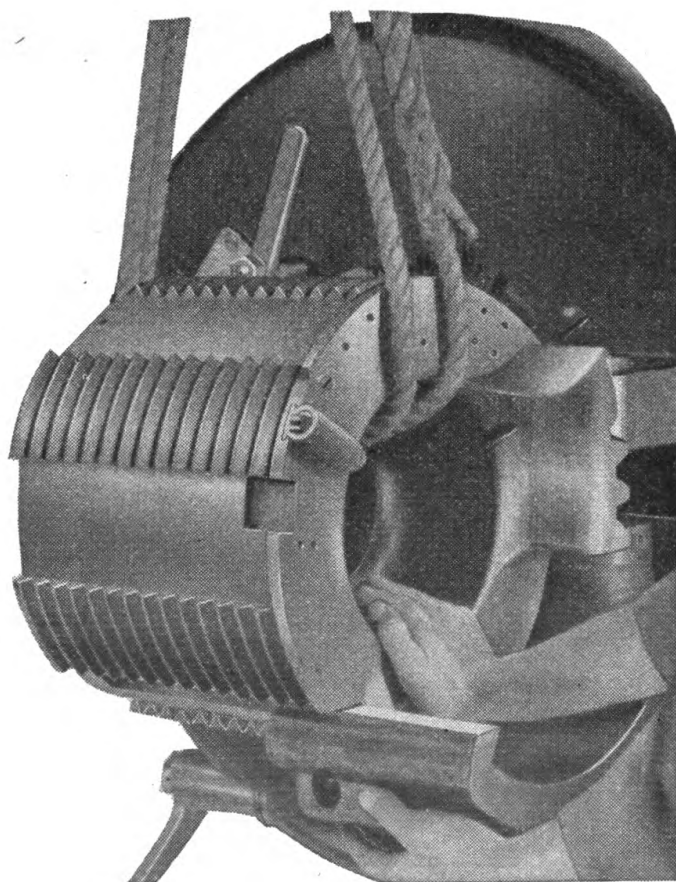
① Pulling breechblock onto tray.

FIGURE 26.—Removing breechblock and tray.



RA PD 10777

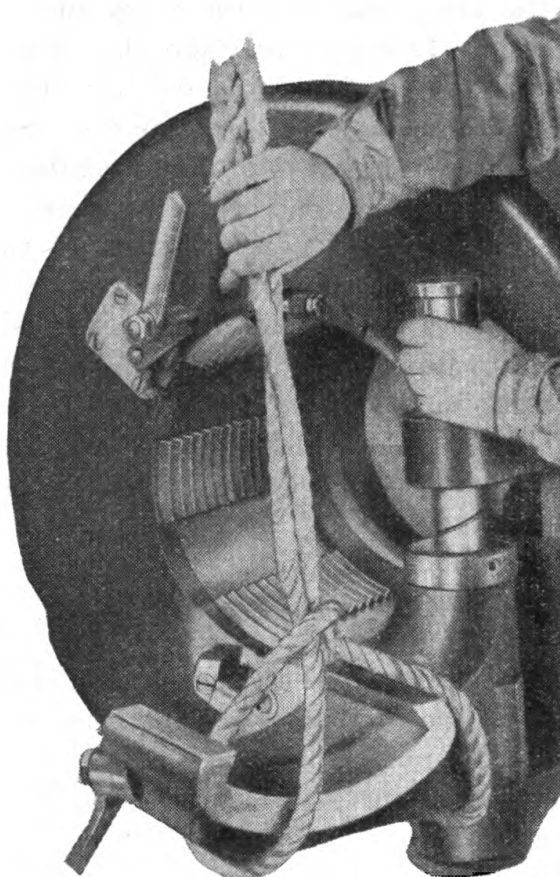
② Breechblock open.



RA PD 10783

③ Sliding breechblock off tray.

FIGURE 26.—Removing breechblock and tray—Continued.



RA PD 10784

④ Removing tray.

FIGURE 26.—Removing breechblock and tray—Continued.

(11) Replace the hinge pin.

(12) By means of the rope and wood block previously inserted, pull the breechblock out of the breech recess, until it is locked on the tray. Care should be taken not to bur or mar the surfaces of the breechblock. As shown in figure 5, locking of the breechblock on the tray is accomplished by the tray latch which unlocks the tray from the breech as it swings back.

(13) Pull the breechblock open approximately 90°.

(14) Remove the wood block and pass the rope through the spindle hole to form a sling for supporting the weight of the breechblock (fig. 26③) and suspend by means of a gin or crane. Lift with the crane just enough to bear the weight of the breechblock.

(15) With the breech open 90°, unlatch the breechblock from the tray by pressing the operating stud of the tray latch in flush with the front face of the tray, and push the breechblock off the tray as shown in figure 26③.

(16) Holding the tray, drift out the hinge pin. Do not let the tray ball bearing drop. Lower the tray and place it aside.

(17) Vigilance must be exercised to detect any cutting or abrasions on the threads of the breechblock or breech recess. Scoring or bruises on the threads should be reported to ordnance maintenance personnel.

b. Cleaning and oiling.—Clean all bright surfaces with dry-cleaning solvent. Be sure all traces of powder stains or rust deposits are removed. Use crocus cloth for cleaning if necessary. Wipe the surfaces dry and remove all particles of grit by using clean rags. Lubricate with a thin film of oil. Apply SAE 10 engine oil to the obturator pad and rub in well.

c. Assembly of breech mechanism.—(1) Place the tray, together with its ball bearing, in position between the hinge lugs.

(2) Replace the hinge pin.

(3) Place the breechblock on the tray in the locked position and push into the breech recess.

(4) Drift out hinge pin.

(5) Replace operating worm wheel and compound gear. Make sure the matching lines of the compound gear and operating worm wheel coincide as shown on figure 28.

(6) Replace the hinge pin.

(7) Replace the hinge pin nut and taper pin.

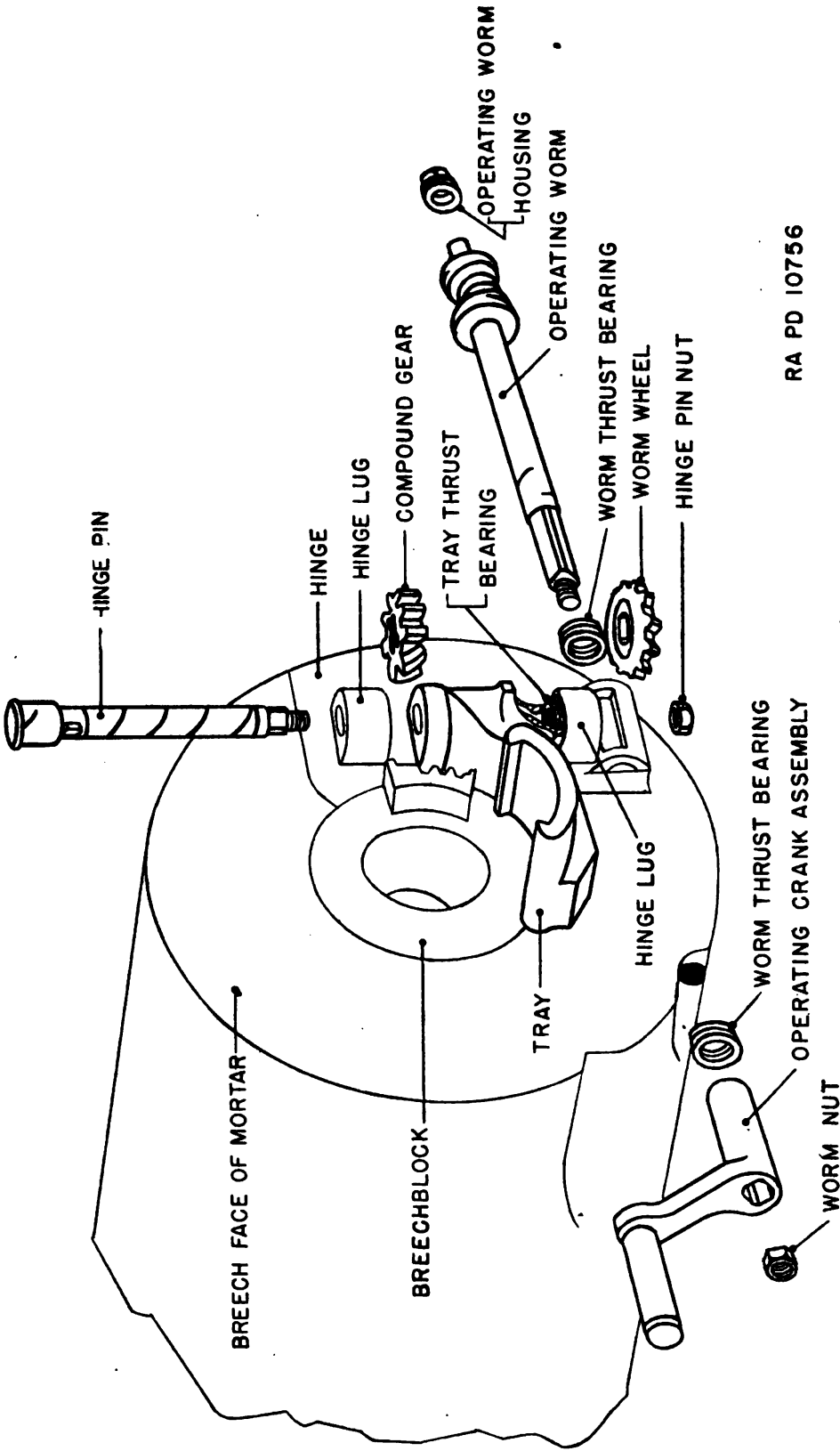
(8) Open the breech and assemble the filling-in disk, split rings, and gas-check pad onto the obturator spindle.

(9) Pass the obturator spindle through the breechblock and assemble the obturator spindle spring and nut. Adjust the tension of the spring so that it is just possible to turn the mushroom head by grasping with the hands. This is done so that the gas-check pad will seat properly.

(10) Turn the operating crank until the breechblock is fully rotated and locked in the breech recess.

(11) Clasp the hinged collar over the end of the spindle, with the two ribs of the collar engaging the corresponding grooves of the spindle and with the hinge at the top.

(12) Take the firing mechanism housing in the right hand, the collar in the left hand and place the housing over the end of the collar. Screw the collar into the housing until the catch on the housing engages the collar. Meanwhile, see that the guide bar which projects from the right side of the mechanism enters its groove in the breechblock, and that the pin on the safety-bar slide (attached to the mortar) enters the hole in the outer end of the safety bar of the mechanism.



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FIGURE 27.—Breech operating mechanism, disassembled.

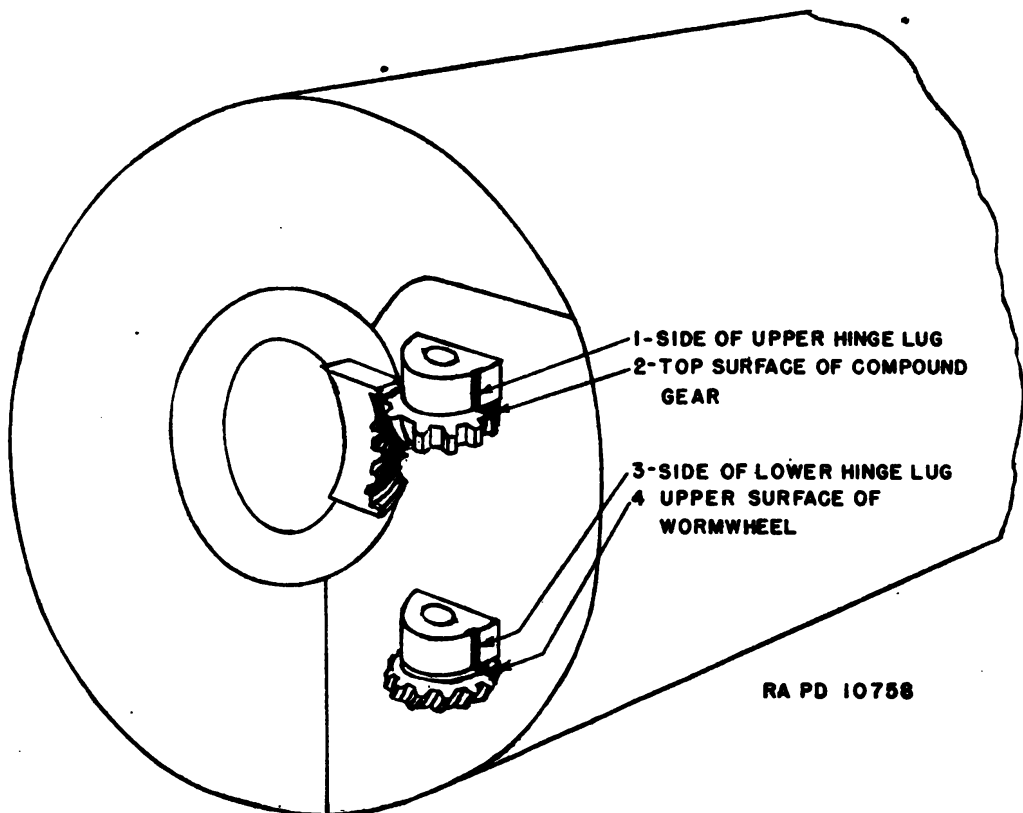


FIGURE 28.—Marking lines for disassembly and assembly of breech mechanism.

28. Disassembly and cleaning of firing mechanism.—*a. Disassembly for cleaning.*—(1) Remove the slide from the housing; draw the slide stop out to the left as far as it will go. The slide may then be lifted from the housing.

(2) To remove the firing leaf and slide catch from the slide, start the split pin which passes through the leaf pivot by pressing upon it, and then draw it out. The pivot is then free to be removed, and its removal frees the leaf and slide catch from the slide.

(3) The collar catch may be removed by unscrewing the screw at the lower edge of the housing.

(4) The slide stop may be removed by unscrewing it from the housing with the wrench provided for that purpose. The slide stop should not be removed except when necessary to repair it or to replace a broken spring.

(5) The contact clip may be removed from the leaf by unscrewing the nut on the underside of the leaf.

b. Cleaning and oiling.—Clean all bright surfaces with dry-cleaning solvent. Be sure all traces of powder stains or rust deposits are removed. Use crocus cloth for cleaning if necessary. Wipe the surfaces

dry and remove all particles of grit by using clean rags. Lubricate with a thin film of engine oil.

29. Lubrication instructions.—*a. General.*—Excessive wear can be prevented and the life of the mortar and carriage increased by keeping the matériel clean and well lubricated. Apply sufficient lubrication but avoid wasteful practices. Excessive lubrication will result in dust accumulations on some moving parts and cause wear and malfunctioning. Particular attention should be given to the lubrication of sliding surfaces of the breech mechanism and to other bearing surfaces that do not contain oil holes, plugs, or grease fittings. Parts should be manipulated while the lubricant is being applied so as to distribute the lubricant over the bearing surfaces. Only the prescribed lubricants as listed in paragraph 33 will be used.

b. Identification of lubrication points.—Lubrication fittings are painted red and oil holes are encircled by a red ring for ease in locating. In cases where this is prevented by inaccessibility, red arrows pointing to such handy oilers or oil holes will be painted upon the nearest convenient surface.

c. Oil holes.—All oil holes must be cleaned out frequently to keep them free from sand and grit. They should habitually be kept closed with the screw plug provided, except during oiling. Before oiling at any hole, wipe off carefully any dirt or grit near the opening that might be carried down into the bearing by the oil. Clean plug and surrounding surface; then remove plug and apply lubricant.

d. Gear cases.—Care must be taken when cleaning oil and grease compartments to insure complete removal of oil residue or sediment. Dirt or other foreign matter should not be allowed to drop into any of the lubricating compartments.

e. Receptacles.—The lubricants will be kept in receptacles plainly labeled with their contents. These should always be kept closed to prevent contamination by water, dirt, etc.

f. Compression grease cups.—Where compression grease cups are provided, precautions against dirt or grit must be observed. In filling these cups do not fill completely, but fill only to the bottom of the bevel at the top of the cup; if too full, the leather packing will become inverted. In putting on the cap, see that the leather follower enters the cup without being caught, cut, or bent by the edge of the cup. Screw the cap down on the cup, using a wrench if necessary to secure sufficient power, until the spring rod projects about $\frac{1}{4}$ inch above the top of the cap. Later, when the spring has recovered and has moved the follower forward, forcing the grease through the tube into the bearings (this will be indicated by the fact that the spring

rod is pulled into the cap until its nut touches or nearly touches the cap), it will be necessary to screw the cap down on the cup until the spring is again compressed. When the cap is screwed nearly home and the spring rod does not project, it is an indication that the cup should be filled.

g. Intervals.—Intervals indicated are for normal service. For extreme conditions of heat, water, dust, etc., lubricate more frequently.

30. Preparation for active season.—*a.* At the beginning of the active season all exposed finished surfaces will be thoroughly cleaned and lubricated. Careful inspection of the condition of finished and unfinished surfaces will be made and rust and marred paint will be removed. Directions for cleaning and preparing surfaces for repainting or touching up are given in paragraph 80.

b. Empty and wash out recoil cylinders with dry-cleaning solvent, using plumber hand force pump, and refill the recoil cylinders. Do not remove packing from the stuffing boxes for this operation.

c. Clean and lubricate the traversing rollers and roller paths. Clean the inner side of the dust guard and repaint as required.

d. Clean and lubricate the traversing and elevating mechanisms. Elevate the mortar and traverse the carriage throughout the 360°.

e. Fill all grease cups; screw cap down until emptied, remove cap and refill. Replace cap and screw two turns.

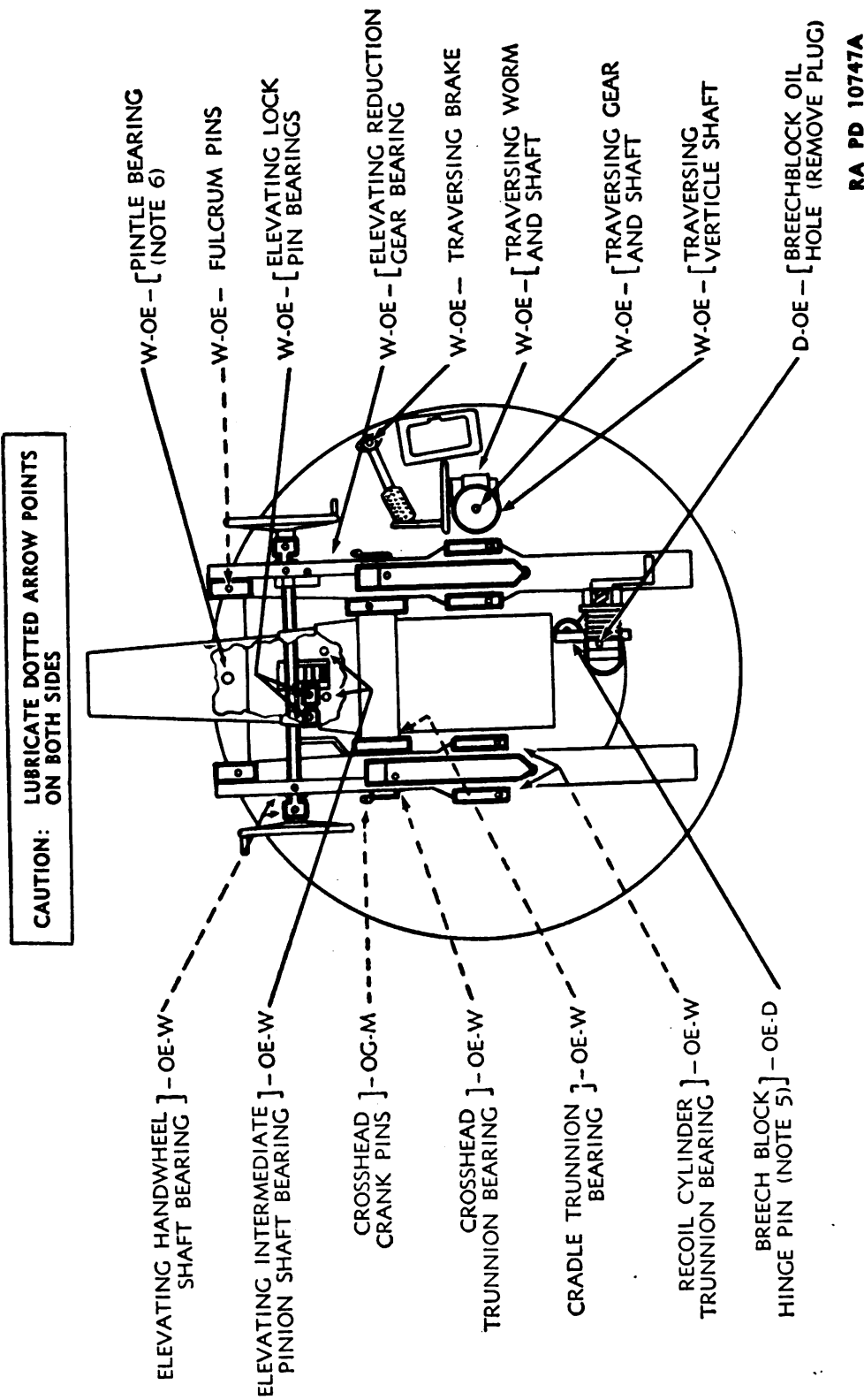
f. Lubricate the pintle bearing. Four oil holes are provided for this purpose. The carriage must be traversed in order to distribute the oil throughout the whole circumference.

g. Clean, lubricate, and replace all covers.

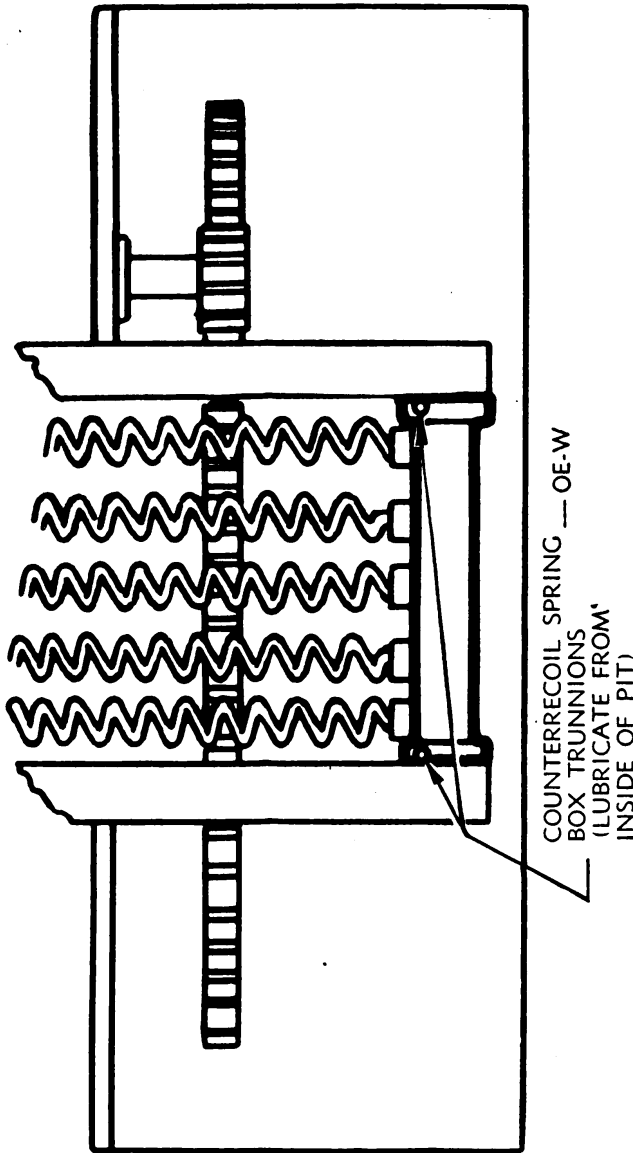
h. Lubricate all parts that can be reached without disassembly.

31. Preparation for inactive season.—*a.* At the beginning of an inactive season or when the weapon is to be unused for a considerable time, the obturator spindle with mushroom head, the split ring, and the filling-in disk will be removed, thoroughly cleaned, dried, slushed with heavy rust-preventive compound, and stored in a dry protected place. Vent holes will be thoroughly cleaned and filled with heavy rust-preventive compound. The gas-check pad will be removed and cleaned with a wet sponge and wooden scraper, and after being thoroughly dried will be coated with SAE 30 engine oil. It will then be stored in the sealed container provided. The obturator spindle holes will be filled with heavy rust-preventive compound.

b. All bright and unpainted surfaces of the tube, breech mechanism, recoil mechanism, etc., will be cleaned with dry-cleaning solvent and the surfaces coated with light rust-preventive compound. This coating can be applied as in painting, using sash tools, No. 6, except that



①
FIGURE 29.—Lubrication chart.



KEY

INTERVALS

D — DAILY

W — WEEKLY

M — MONTHLY

LUBRICANTS

OE — OIL, ENGINE
SAE 10 (BELOW 32° F.)
SAE 30 (ABOVE 32° F.)

OG — GREASE, O.D.
NO. 00 (BELOW 32° F.)
NO. 0 (ABOVE 32° F.)

ADDITIONAL LUBRICATION INSTRUCTIONS

1. TRAVERSING AND ELEVATING RACK - CLEAN AND APPLY ENGINE OIL, DAILY.
2. RECOIL SLIDES - KEEP EXPOSED SURFACES COATED WITH ENGINE OIL. CLEAN AND LUBRICATE BEFORE AND AFTER FIRING.
3. BREECH AND FIRING MECHANISM - CLEAN AND OIL ALL MOVING METAL PARTS AND EXPOSED METAL SURFACES WITH ENGINE OIL, DAILY. KEEP ROTATING CRANK WORM AND INTERNAL GEAR RACK COATED WITH ENGINE OIL.
4. PINTLE BEARING - TRAVERSE CARRIAGE 360 DEGREES WHILE OILING.
5. OIL CAN POINTS - LUBRICATE COUNTERRECOIL SPRING GUIDE SPINDLES, ELEVATING LOCK LEVER, HANDWHEEL HANDLES, TRAVERSING LOCK LATCH, ETC., WITH ENGINE OIL WEEKLY.

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③
FIGURE 29.—Lubricating chart—Continued

in cold weather it should be applied by stippling, that is, light tapping, with the brush held perpendicular to the surface to be covered.

c. All painted surfaces should be carefully examined. Particular care should be given to painting and touching up operations to obtain the maximum protection against rust, erosion, etc. The protective coating of paint prevents the matériel from deteriorating rapidly.

d. Ammunition trucks are to be stored at the emplacements. To preserve the tires, place wooden blocks under the axle and rear of the truck of sufficient height to raise the wheels off the floor.

32. Service of mortar and carriage during inactivity.—*a.* At intervals not to exceed 6 days, all coated surfaces will be examined, cleaned, and recoated where the light rust-preventive compound has come off. The carriage should be traversed about 30° from its former position to prevent the rollers from rusting at bearing surfaces. Immediately after rain or snow, all surfaces should be carefully examined and recoated where necessary. In all cases light rust-preventive compound should be applied in a thin coat, as this is all that is needed to give good protection.

b. At regular intervals of 30 days or less the recoil cylinders should be filled and the carriage should be maneuvered throughout its complete range of azimuth and elevation. The carriage should be left in traverse about 30° from its former position.

c. It is especially required that all parts of the carriage be kept clean at all times. Rust should not be allowed to accumulate on piston rods or bearing surfaces and this requires particular attention. The use of sandpaper or emery cloth for the purpose of removing rust, etc., is forbidden. The rust may be softened, if necessary, with dry-cleaning solvent and removed with crocus cloth.

33. Servicing materials.—The following materials are commonly required for servicing the mortar. A more complete list of materials required for care and preservation and detailed particulars regarding their composition, application, and use are given in TM 9-850.

a. Table of lubricants.

Lubricant	When used	Purpose
Grease, O. D., No. 00-----	Below 32° F--	} Used in the compression grease cups for the trunnion bearings.
Grease, O. D., No. 0-----	Above 32° F--	
Oil, engine, SAE 10-----	Below 32° F--	} Used on cross-head guides of the recoil mechanism, breech and firing mechanisms, elevating and traversing mechanisms, etc.
Oil, engine, SAE 30-----	Above 32° F--	

NOTE.—Oil, lubricating, chain and wire rope, is used to protect the dragline (fig. 41 ©), hoist chains, etc.

b. Cleaning materials.

Cloth, crocus.

Paper, flint, No. 00.

Paper, flint, No. 1½.

Paper, flint, No. 1.

Paper, flint, No. 2.

Patches, cut (canton flannel).

Polish, metal, paste.

Remover, paint and varnish.

Soda, caustic (lye), for cleaning purposes.

Solvent, dry-cleaning.

Sponge.

Waste, cotton, colored.

Waste, cotton, white.

(1) *Flint paper*.—Issued for use on woodwork such as rammer handles and armament chests. Do not use on metal surfaces.

(2) *Caustic soda* (lye).—Issued and used for cleaning purposes, and in the preparation of paint removers.

(3) *Sponges*.—Used for washing and cleaning matériel. Natural sponges may be replaced by cellulose sponges in sizes No. 4 (approximate dimensions 1¼ by 3¼ by 4⅝ inches); No. 6 (approximate dimensions 1⅝ by 3½ by 5¼ inches); No. 8 (approximate dimensions 2 by 3⅞ by 6¼ inches); No. 10 (approximate dimensions 2½ by 4⅝ by 6½ inches). Cellulose sponges must not be wrung. Squeezing is the proper method of removing water.

(4) *Cotton waste* (two grades, colored and white).—(a) The colored cotton waste is used for general cleaning purposes on the exteriors of ordnance matériel. It is also used as calking for cracks from which it is desired to exclude dust and dirt.

(b) White waste is used for general cleaning purposes on finished surfaces of ordnance matériel. If no white cotton waste is on hand, an equivalent amount of clean wiping cloths may be used.

c. Preserving materials.—During both active and inactive seasons the lubricating oils and greases serve as preservatives as well as lubricants. Therefore thorough lubrication is doubly important. Light rust-preventive compound and heavy rust-preventive compound are used to protect exposed finished surfaces of parts in storage and of the mortar during inactive periods.

d. Recoil oil.—Light recoil oil will be used in the recoil cylinders.

SECTION VII

INSPECTION AND ADJUSTMENT

	Paragraph
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Mortar tube	35
Breech mechanism	36
Firing mechanism	37
Base ring	38
Elevating mechanism	39
Traversing mechanism	40
Recoil and counterrecoil mechanism	41
Electrical equipment	42
Lanyard safety device	43

34. General.—*a.* Inspection has as its purpose the detection of conditions which might cause improper performance. Such conditions may be caused by—

(1) Mechanical deficiencies resulting from ordinary wear, breakage, etc.

(2) Faulty or careless operation.

(3) Improper care (servicing, lubrication, etc.).

Inspection should always be accompanied by corrective measures to remedy any deficiencies found. When properly carried out, inspection and necessary corrective maintenance will insure the maximum reliability and performance of the matériel. The following inspection should be made at regular intervals not to exceed 30 days during both active and inactive seasons.

b. Before inspecting particular points, the mortar and carriage should be inspected in general for evidences of faulty operation, care, and maintenance. Any unusual conditions which might result in improper operation or damage to the matériel will be immediately remedied. Untidy appearance and evidences of rust or deterioration will be corrected. Missing or broken apparatus will be replaced.

35. Mortar tube.

Inspection

a. Bore.—Note condition of the bore. Look for rust on the lands and carbon deposits in the grooves.

b. Gas-check pad seat.—Examine the gas-check pad seat for burs or roughness.

Adjustment

a. Remove rust or carbon deposits. Clean and slush. Wipe dry and lubricate.

b. Remove burs or roughness with crocus cloth. If the surfaces cannot be smoothed in this manner, notify ordnance maintenance personnel. Do not use any other abrasive.

36. Breech mechanism.*Inspection*

a. Operation.—Note smoothness of operation of the breech mechanism in opening and closing.

b. Breechblock and breech recess.—Examine the breechblock and breech recess for burs or indentations on the threads, and for rust, pitting, and other evidences of erosion.

c. Obturator.—Examine the obturator spindle for burs.

d. Split rings.—Examine the split rings for burs or cracks.

e. Gas-check pad.—Examine gas-check pad for bruises or torn covering.

37. Firing mechanism.*Inspection*

a. Note the action of the safety-bar mechanism when the breech is opened and closed. See that the safety-bar slide mechanism functions properly.

b. Make sure the firing leaf is not distorted.

c. Check the tension of the firing leaf spring.

d. Make sure that accumulations of dirt do not hold the leaf away from the slide.

e. Test firing mechanism by firing a friction primer, using the primer flame baffle (par. 62).

Adjustment

a. If the mechanism binds or does not operate smoothly, disassemble, clean, examine the parts for wear or breakage, and replace unserviceable parts. Lubricate the mechanism and reassemble. If it is still difficult to operate, notify ordnance maintenance personnel.

b. If not possible to smooth up or clean with crocus cloth, notify ordnance maintenance personnel. Do not use any other abrasive.

c. If possible, smooth the spindle, using crocus cloth; if not possible, notify ordnance maintenance personnel.

d. Replace defective rings.

e. Replace defective pad.

Adjustment

a. Repair or replace parts of the safety-bar slide mechanism which are worn or broken.

b. Repair, straighten, or replace the firing leaf.

c. Replace weak or broken spring.

d. Disassemble and clean dirty mechanism.

e. If the slide will not close over primer head or if it distorts the primer head, ream out the primer seat.

38. Base ring.*Inspection*

To test the base ring for levelness, place the bore rest in the muzzle of the mortar. Place the clinometer on the bore rest. Level the mortar and observe the bubble as the mortar is traversed.

Adjustment

If the maximum error is more than 10 minutes, notify ordnance maintenance personnel.

39. Elevating mechanism.*Inspection*

a. Test the effort required to elevate and depress the mortar.

b. (1) With the mortar resting on the depression stop, the friction of the elevating clutch should be just sufficient to cause slipping of the parts of the elevating gearing when a force of 156 pounds is applied to the elevating handwheel shaft at a point 100 inches from the center of the shaft. The friction may be determined by means of weights or a spring balance.

(2) The proper amount of friction is also indicated when the combined efforts of two men (one at each handwheel) are just sufficient to cause slipping of the friction device when an attempt is made to depress the mortar below the minimum.

c. Inspect the elevating rack to see that it is firmly attached to the mortar.

d. Examine the pintle bearing for proper lubrication.

Adjustment

a. If extra effort is necessary, lubricate. If this fails to remedy, notify ordnance maintenance personnel.

b. Adjust clutch spring adjusting nut (fig. 15).

c. Tighten bolts.

d. Lubricate, if necessary.

40. Traversing mechanism.*Inspection*

a. Test the effort required to traverse the mortar to the left and right with the traversing brake off. The mechanism should function smoothly.

Adjustment

a. Lubricate, if extra effort is required to traverse. If this fails to remedy, notify ordnance maintenance personnel.

Inspection

b. Test the effort required to traverse the mortar with the traversing brake on. With the brake on, one man should with difficulty be able to traverse the carriage.

c. Examine traversing rollers, roller paths, and dust guards for rust and other evidences of improper distribution of lubricant.

d. Examine the azimuth pointer to see that it does not bind or rub.

41. Recoil and counterrecoil mechanism.*Inspection*

a. Check recoil cylinders for proper amount of oil. The oil should stand at the level of the filling holes.

b. Make sure all counterrecoil spring caps bear against the knife-edge bearing in the top carriage.

c. See that the cross-head guides are clean and well lubricated.

d. Make sure the piston rods are screwed home in the cross heads.

e. Inspect for any leakage of oil around the cylinder heads, where the heads are screwed into the cylinders.

f. Inspect for leakage at stuffing boxes or followers.

Adjustment

b. If there is too much slippage, tighten the adjusting nut.

c. Lubricate, if necessary.

d. Adjust tap bolts or replace.

Adjustment

a. Refill, if necessary.

b. Adjust loose springs by means of the adjusting nuts.

c. Clean and lubricate, if necessary.

d. If loose, notify ordnance maintenance personnel.

e. Notify ordnance maintenance personnel.

f. Tighten followers. Care should be taken not to tighten too much, as this produces excessive friction on the rods. One man using the wrench provided is able to tighten the followers sufficiently. Do not use a pipe for additional leverage on the wrench as this will shear the threads. If this does not stop leakage, the boxes need repacking. Notify ordnance maintenance personnel.

Inspection

g. Inspect for leakage at points where equalizing pipes enter the cylinders or at emptying coupling or emptying plug.

42. Electrical equipment.*Inspection*

a. Cables.—Note condition of exposed cables.

b. Receptacle boxes.—See that the watertight covers on the receptacle boxes are properly sealed.

c. Lighting circuit.—Test lighting circuit for functioning by turning on the switch.

d. Firing circuit.—(1) Test firing circuit by firing an electric primer. Be sure to use the primer flame baffle (par. 62).

(2) Test firing plug to see that it is withdrawn freely when the mortar is depressed to 41°.

(3) Note condition of contacts inside the plug box.

(4) Check to see that the spring cover snaps into place when the firing plug is withdrawn.

43. Lanyard safety device.

Test the lanyard safety device for functioning. Elevate the mortar to 41° and hook the bridle ring in the bridle ring catch. While exerting a strong, steady pull on the lanyard, elevate the mortar slowly to 43°. The ring should drop free of the catch while the mortar is being elevated through this arc of 2°. Return the mortar to the loading position and see that the bridle ring catch does not bind or become distorted during this movement.

Adjustment

g. Insert new gaskets.

Adjustment

a. Repair frayed insulation by taping. Replace damaged conductors.

b. Replace defective gasket.

c. Replace lamps, if necessary. If circuit fails to function, notify ordnance maintenance personnel.

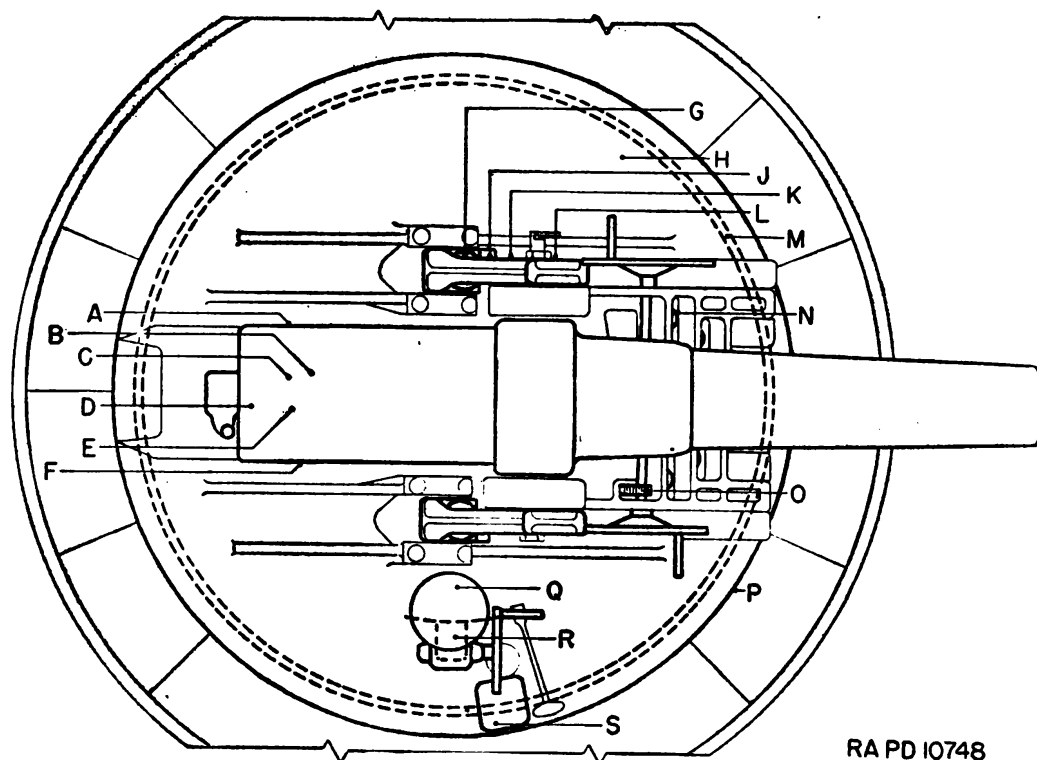
d. (1) If firing circuit does not function properly, notify ordnance maintenance personnel.

(2) Adjust firing plug safety chain.

(3) If broken, notify ordnance maintenance personnel.

(4) Replace, if necessary.

If this device does not function properly, notify ordnance maintenance personnel.



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- A. Chain for removing firing plug—function.
 B. Gas-check seat—condition.
 C. Bore—erosion.
 D. Firing mechanism—function.
 E. { Breechblock—condition.
 Obturator spindle—condition.
 Split rings—condition.
 Gas-check pad—torn covering—resiliency.
 F. Lanyard safety device—function.
 G. Recoil cylinders—filled.
 H. Base ring—adjustment.
 J. Piston rod—adjustment.
 K. Cross-head guides—lubrication.
 L. Elevation quadrant—adjustment.
 M. Pintle bearing—lubrication.
 N. Counterrecoil springs—adjustment.
 O. Elevating mechanism—function.
 P. Dust guard—function.
 Q. Traversing mechanism—function.
 R. Receptacle box—watertight cover in place.
 S. Azimuth pointer—function.

NOTE.—For inspection of electrical parts see text.

FIGURE 30.—Inspection chart.

SECTION VIII

REPAIR

	Paragraph
General	44
Broken equalizing pipe	45

44. General.—*a.* Wear, breakage, or damage from enemy fire makes necessary the occasional disassembly and repair of various parts of the gun and mount. This comes under two headings: that which can be performed by the battery personnel with the equipment furnished, and that which must be performed by trained ordnance personnel. In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the respon-

sible ordnance service should be informed in order that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

b. Disassembly, assembly, and such repairs as may be handled by using arms personnel will be undertaken only under the supervision of an officer or the chief mechanic.

45. Broken equalizing pipe.—In the event that the equalizing pipe becomes damaged, by enemy fire or otherwise, the mortar may be kept in action by means of the plugs provided for this purpose. Remove the damaged equalizing pipe and followers and insert the plugs in the equalizing pipe seats in the cylinders.

SECTION IX

AMMUNITION

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46. General.—Ammunition for the 12-inch mortar M1912 is of the separate loading type. The loading of a complete round requires three operations: loading the projectile, loading the propelling charge, and inserting the primer. The components of a complete round—projectile, propelling charge, and primer—are shipped separately. Deck-piercing projectiles are the only type of service ammunition used in this mortar; they are shipped fuzed.

47. Firing tables.—For applicable firing tables, see appendix.

48. Classification.—Dependent upon the type of projectile, ammunition for this mortar is classified as deck-piercing, target practice, and dummy. Deck-piercing projectiles are thick-walled shells fitted with deck-piercing caps and filled with a comparatively small amount of high explosive as a bursting charge. Target practice projectiles are inert cast iron shot similar in size, shape, and weight to service projectiles. Dummy projectiles are inert steel and bronze assemblies

of size, shape, and weight somewhat similar to service projectiles, used for training in handling projectiles and loading the mortar.

49. Identification.—*a. General.*—Ammunition components are completely identified by means of painting, marking, data cards, and linen tags. (See figs. 31 to 39 and the paragraphs below.)

b. Mark or model.—To identify a particular design, model numbers are assigned at the time the design is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature and is included in the marking on the item. The present method of model designation consists of the letter M followed by an Arabic numeral. Modifications are indicated by adding the letter A and appropriate Arabic numerals. Thus M2A1 is the first modification of an item for which the original model designation was M2. Prior to the first World War, the model designation assigned was the year in which the design was adopted, preceded by an M, for example, M1912. From the first World War until July 1, 1925, it was the practice to assign mark numbers. The word "mark," abbreviated "Mk.," was followed by a Roman numeral, for example, shell, DP, Mk. III. The first modification of a model was indicated by the addition of MI to the mark number, the second by MII, etc.

c. Ammunition lot number.—For separate loading ammunition, a lot number is assigned and marked on each of the components. Unless the item is too small, the lot number is stamped or marked on all packing containers and on the ammunition data card or tag. It is required for all purposes of record, including reports on condition, functioning, and accidents in which the ammunition is involved. To insure uniform functioning, all of the components in any one lot are manufactured under as nearly identical conditions as possible. The complete round consists of projectiles made by one manufacturer loaded by one manufacturer, and of one weight. Therefore, to obtain the greatest accuracy in firing, successive rounds should consist of projectiles of one lot number, fuzes of one lot number, propellant pounds of one lot number, and primers of one lot number, whenever practicable.

d. Ammunition data card.—This 5- by 8-inch card accompanies each shipment of ammunition components. A linen tag containing similar data is attached to propelling charges.

e. Painting and marking.—(1) *Painting.*—Ammunition is painted to prevent rust and to provide, by the color, a ready means of identification as to type. Ammunition for the 12-inch mortar is painted as follows:

Deck-piercing----- Yellow; marking in black.

Target practice (inert). Black; marking in white.*

Dummy or drill (inert) Black; marking in white, except band at center of gravity, which is red.

(2) *Marking.*—For purposes of identification, the following markings appear on the components of separate loading ammunition:

(a) *On projectiles.*

Caliber and type of cannon in which fired.

Kind of filler, for example, TNT, EXP. D, etc.

Mark or model of projectile.

Weight marking.

Lot number.

(b) *On propelling charge.*

Designation of section, for example, BASE ZONE 4 on base section of a base and increment charge.

Type of powder and powder lot number.

Caliber and type of cannon in which fired.

Weight of igniter charge.

On dummy propelling charges: DUMMY CHARGE or DUMMY PROPELLING CHARGE together with the caliber and model of gun in which it is used.

(c) *On fuze (stamped on body).*

Type and model of fuze.

Loader's initials.

Month and year loaded.

Loader's lot number.

(d) *On primer (stamped in metal).*

Initials of loader.

Loader's lot number.

Year of loading.

Mark or model number.

f. Weight markings.—It is not practicable to manufacture projectiles within the narrow weight limits required for the desired accuracy of fire. Therefore, the actual weight of the projectile, to the nearest pound, is stenciled on the projectile in order that the percentage difference from the normal weight may be determined and appropriate ballistic corrections from the firing tables applied.

*It should be noted that the above color scheme is not wholly in agreement with the basic color scheme described in TM 9-1900, practice projectiles being generally painted blue.

50. Care, handling, and preservation.—*a.* Ammunition components are packed to withstand conditions usually found in the field. Projectiles for this mortar are shipped with a grommet to protect the rotating band. Projectiles with deck-piercing caps or windshields are shipped crated; practice shell, uncrated. Charges and primers are packed in moisture-resistant containers.

b. Since explosives are adversely affected by moisture and high temperature, due consideration should be given to the following provisions:

(1) Do not break the moisture-resistant seal until the ammunition is to be used.

(2) Protect ammunition, particularly fuzes, primers, and propelling charges from high temperatures, including direct rays of the sun. More uniform firing is obtained if successive rounds are at the same temperature.

c. Do not attempt to disassemble any fuze.

d. Primers must always be stored in a dry place. Prolonged exposure to moisture or dampness may cause malfunctioning.

e. Explosive ammunition, or components containing explosive, must be handled with appropriate care at all times. The explosive elements in primers and fuzes are particularly sensitive to undue shock and high temperature.

f. Before loading, each of the separate loading components should be free of foreign matter—sand, mud, moisture, grease, etc.

g. Sealed containers should not be opened until just before use.

h. Components of rounds prepared for firing but not fired will be returned to their original condition and packings and appropriately marked. Such components will be used first in subsequent firings, in order that stocks of opened packings may be kept at a minimum.

i. Propelling charges will be gaged for maximum diameter by gages furnished by the Ordnance Department. Charges which do not pass through the gage will not be fired. A charge made up of a single section which contains a core igniter need not be gaged.

51. Authorized rounds.—The ammunition authorized for use in this mortar is listed in the table below.

12-INCH SEACOAST MATÉRIEL

Ammunition for 12-inch mortar, M1912

Nomenclature of fuzed projectile	Fuze		Propelling charge (model or type)	Primer (model)
	Model	Action		
Service ammunition: Shell, DP, 700-pound, M1911A, 12-inch mortar.	Mk. X	Delay	M6, B&I zone 8B-10 or B&I zone 8B-10. ¹	M30. ²
Shell, DP, 1,046-pound, Mk. XXVIII, 12-inch mortar.	Mk. X	Delay	M5, B&I zone 4-8A or B&I zone 1-8. ¹	M30. ²
Shell, DP, 1,046-pound, M1898, 12-inch mortar.	Mk. X	Delay	M5, B&I zone 4-8A or B&I zone 1-8. ¹	M30. ²
Target practice ammunition: Shell, CI, 700-pound, M1912, 12-inch mortar.	None	-----	M6, B&I zone 8B-10 or B&I zone 8B-10. ¹	M30. ²
Shell, CI, 1,046-pound, M1907, 12-inch mortar.	None	-----	M5, B&I zone 4-8A or B&I zone 1-8. ¹	M30. ²
Dummy ammunition: Projectile, dummy, 700-pound, Mk. IA1, 12-inch mortar.	None	-----	SS Dummy, 33-, 65-, or 85-pound. or 4-section, dummy, 8-, 16-, 20-, and 24-pound.	Inert M30. ²
Projectile, dummy, 1,046-pound, 12-inch mortar.	None	-----	SS Dummy, 33-, 65-, or 85-pound. or 4-section, dummy, 8-, 16-, 20-, and 24-pound.	Inert M30. ²
Subcaliber ammunition: Shot, (fixed, solid, subcaliber, 2.95-inch gun zone 1, 2, or 3.	None	-----	Fixed	M24A2.

¹ See par. 54.² Primer, electric, M30, is standard primer; in case of power failure, primer, friction, M1914, will be used.³ Live primer furnished with round. Primer to be fired by the service and retained for use with dummy projectile and charge.

52. Preparation for firing.—a. Projectiles.—After removal of the packing material, the deck-piercing and practice projectiles can be stored in the magazines. Before being served to the mortars, projectiles will be prepared as follows:

(1) All projectiles should be weighed and, so far as practicable, those of approximately the same weight selected for firing. Uniformity in this respect is especially desirable in adjustment. The mean projectile weight will be applied to the range correction board. Target practice projectiles will be brought to uniform weight by sand loading. In case the projectile is brought to standard weight before the cavity is completely filled with sand, the sand may shift within the projectile during flight and cause erratic behavior. This difficulty may be avoided by completely filling the cavity with a mixture of sawdust and sand and bringing to standard weight by adding water.

(2) All projectiles should be thoroughly cleaned and the paint removed from the bourrelets.

(3) Grease and oil should be removed from the projectile before it is fired.

(4) The rope grommet which protects the rotating band should be removed before firing.

b. Propelling charges.—Propelling charges should be removed from the cartridge storage case and the igniter protector cap and data tag removed from the charge. When firing other than a full charge, the tapes are untied, the excess zone increments removed, and the tapes retied. Care should be exercised to have the red igniter bag at the rear of the charge when loaded.

c. Primers.—Primers should be carefully examined and tested before any attempt is made to use them. All primers should be tested in the firing mechanism of the mortar with which they will be used to check proper fit. In addition, electric primers should be tested for proper resistance, if the equipment is available.

53. Projectiles.—a. General.—The projectiles listed in paragraph 51, which are authorized for use in the 12-inch mortar, M1912, are of two weights: 700-pound and 1,046-pound. The 824-pound projectile used in other 12-inch mortars is not authorized for use in the M1912 mortar. All of the service projectiles are of the deck-piercing type, fitted with a deck-piercing cap and a base-detonating fuze. The practice and dummy projectiles are inert and unfuzed. The target practice projectiles are of cast iron and are similar in size, shape, and weight to the service shell. The dummy projectiles used for drill are of similar weight and size to service projectiles. Service projectiles are fitted with base covers to prevent the hot gases from the propel-

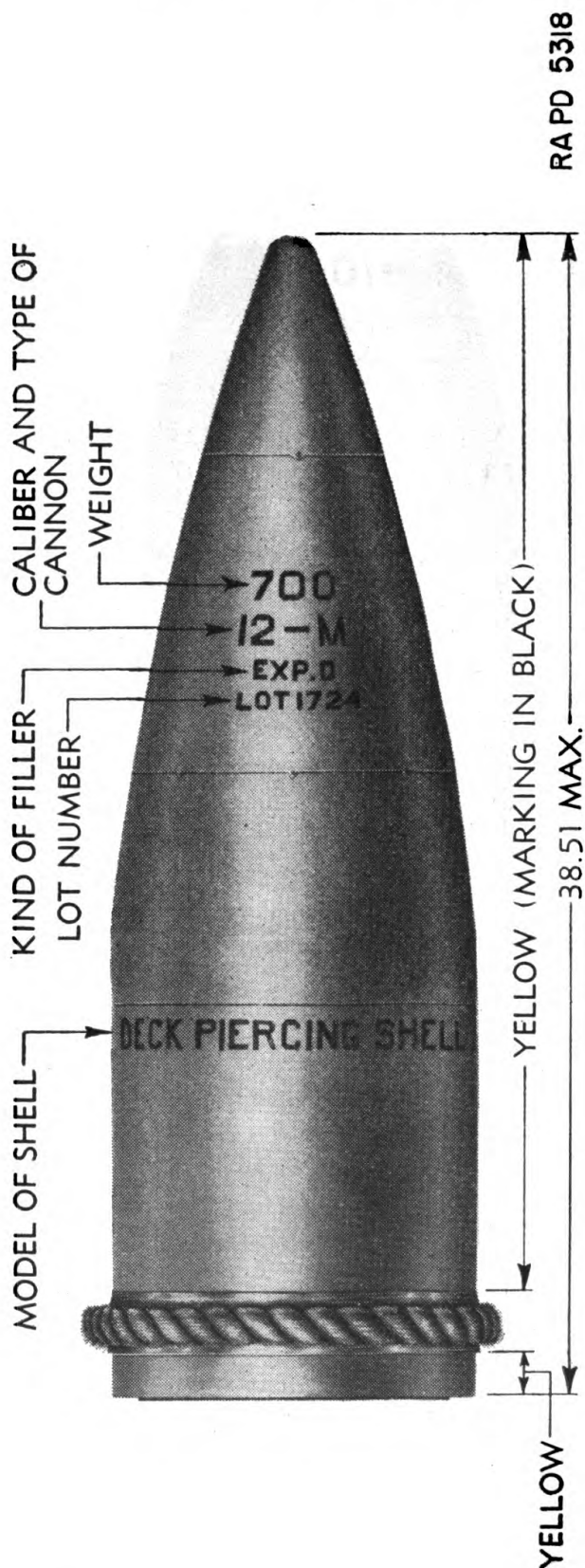


FIGURE 31.—Shell, DP, 700-pound, M1911A.



FIGURE 32.—Shell, DP, 1,046-pound, Mk. XXVIII.

ling charge from coming in contact with the explosive filler through possible flaws in the base. Rotating bands are fitted with a rope grommet to protect the bands during shipment and storage.

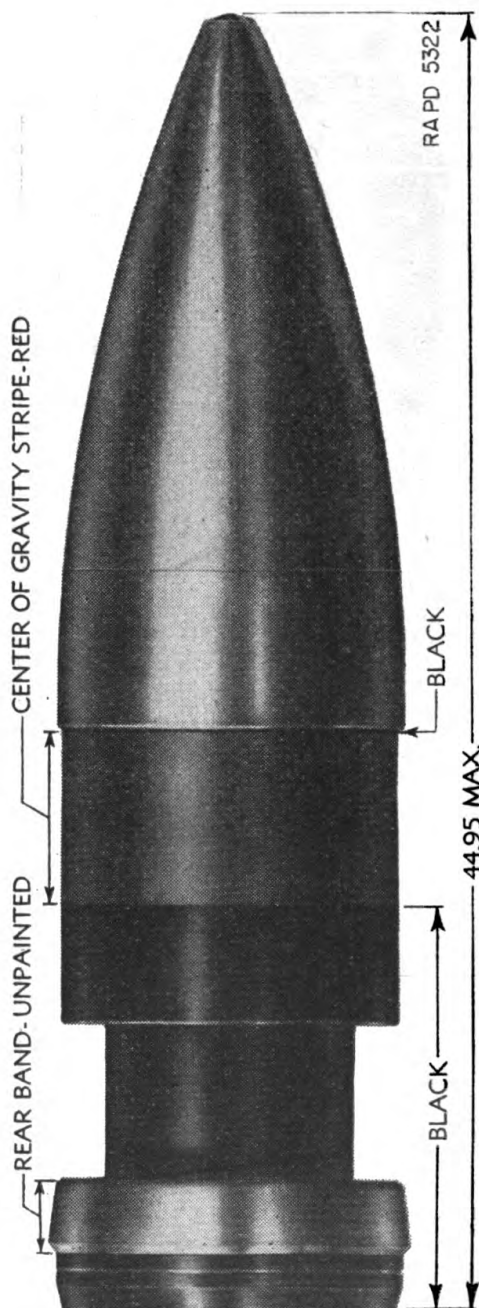


FIGURE 33.—Projectile, dummy, 700-pound, Mk. 1A1.

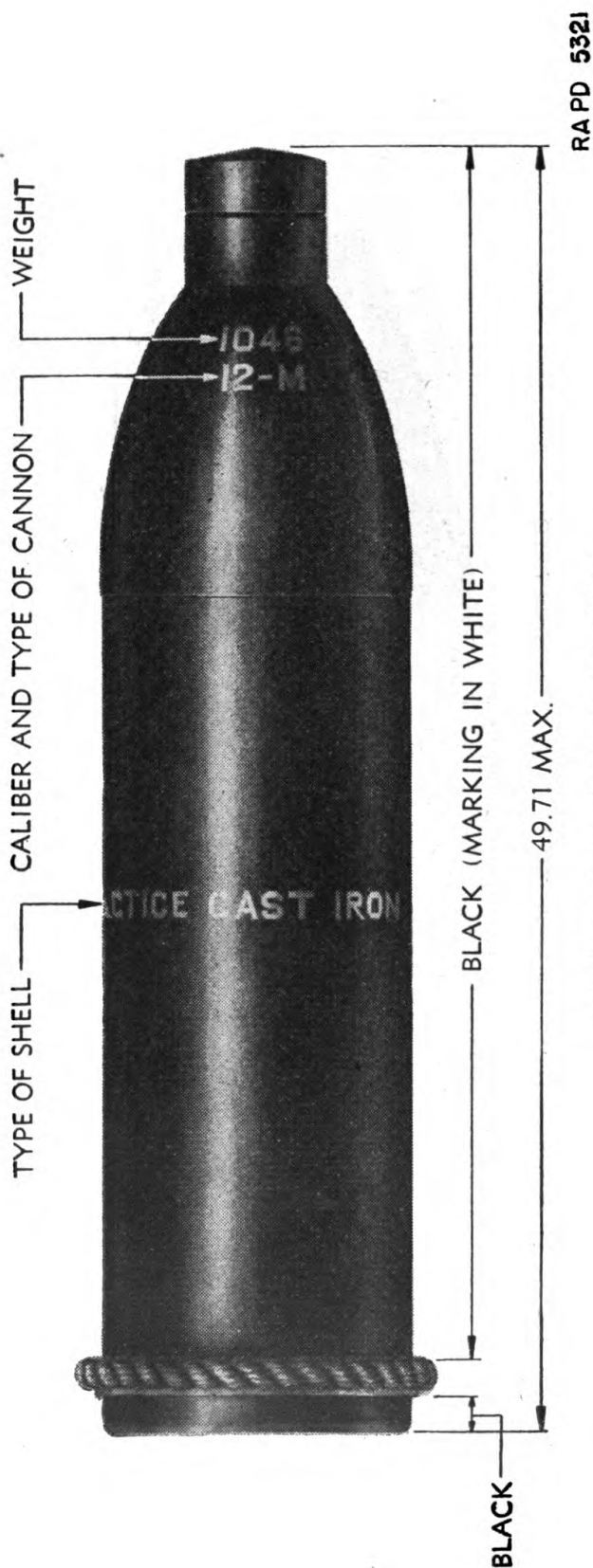


FIGURE 34.—Shell, CI, 1,046-pound, M1907.

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b. Characteristics of projectiles for 12-inch mortar M1912.

Name	Length (inches)	Weight as fired (pounds)	Point	Base	Fuze	Rotating band	Explosive charge	How shipped
Shell, DP, 700-pound, M1911A-----	38.4	700	DP cap and wind- shield.	Square	BD delay action.	2-inch cop- per.	24.16-pound explosive D.	Crated.
Shell, DP, 1,046-pound, Mk. XXVIII.	49.31	1,046	DP cap-----	Square	BD delay action.	1.25-inch cop- per.	58.52-pound explosive D.	Crated.
Shell, DP, 1,046-pound, M1898-----	49.15	1,046	DP cap-----	Square	BD delay action.	1.25-inch copper.	58.35-pound explosive D.	Crated.
Shell, CI, 700-pound, M1912-----	38.4	700	-----	Square	None-----	2-inch cop- per.	None-----	Uncrated.
Shell, CI, 1,046-pound, M1907-----	49.7	1,046	-----	Square	None-----	1.27-inch copper.	None-----	Uncrated.
Projectile, dummy, 700-pound, Mk. IA1.	45	700	-----	Square	None-----	3.26-inch rear ring.	None-----	Crated.
Projectile, dummy, 1,046-pound-----	49.2	1,046	False AP cap.	Square	None-----	3.26-inch rear ring.	None-----	Crated.

54. Propelling charges.—*a. General.*—(1) *Description.*—Service and practice propelling charges for the 12-inch mortar M1912 are of the base and increment type. This type of charge (figs. 35 and 36) is divided into a base charge and several increments which, generally, are smaller than the base charge. The base charge is assembled into a bag which has the igniter charge divided into three parts, one in a pad in each end connected by an axial cloth tube containing the third. In charges of current manufacture, the igniter pads are dyed red to denote the presence of black powder and to call attention to that end of the charge which must be to the rear (breech end) of the chamber when loaded; in older charges, the igniter cloth is undyed but stenciled with the words IGNITING POWDER. The base charge and increments are tied together by four straps sewed to the bag of the base section. Dummy charges are composed of bags of small wood and lead cylinders, simulating service powder charges.

(2) *Containers.*—Propelling charges are stored and shipped in air-tight metal cartridge storage cases. In order to prevent accidental detonation of the charges, igniter protector caps should be placed in the storage cases as follows: one on each end of each base charge and one on the top section in the case. These caps must be removed prior to loading the charge into the mortar.

(3) *Preparation for firing.*—To prepare the charge for firing—

(a) Remove the igniter protector cap and data tag.

(b) Adjust the number of increments to correspond to the zone to be fired.

(c) Gage the charge for maximum diameter. If the charge passes through the gage it is ready for firing.

b. Propelling charge (base and increment) M5, zone 4-8A, 1,046-pound projectile.—This charge (fig. 35) is used for firing the 1,046-pound projectile only. It consists of a base charge for zone 4 and increments for zones 5, 6, 7, and 8A. It is considered that there is now no necessity for ranges shorter than zone 4. The complete charge assembly is 27 to 28.5 inches in length and 10.75 inches in diameter. It consists of approximately 66.75 pounds of smokeless powder and 12 ounces of black powder igniter. The base section (zone 4) contains 33.00 pounds of smokeless powder. The increments contain: zone 5, 5.25 pounds; zone 6, 6.75 pounds; zone 7, 9.81 pounds; zone 8A, 11.94 pounds. The base section is marked as follows:

<i>End (dyed red)</i>	<i>Side</i>	<i>Meaning of side marks</i>
4 OZ.	WT. 32 LBS. 12 OZ.	(Weight of section)
IGNITER	BASE	(Zone)
WITH 4 OZ. CORE	ZONE 4	
A1 BLK. PDR.	12 IN. MORTAR	(Size and type of weapon)
12 IN. MORTAR	M1912	(Model of weapon)
M1912	CHARGE M5	(Model of charge)
	XX-NH-XX LOT	(Type and lot number of charge)
	1234-56.	

The increments are not marked.

c. Propelling charge (base and increment) M6, 700-pound projectile.—This charge (fig. 36) is used for firing the 700-pound projectile only. It consists of a base charge for zone 8B and increments for zones 9 and 10. The complete assembly is 27 to 28.5 inches in length and 12.25 inches in diameter. It contains approximately 91.24 pounds of smokeless powder and a 12-ounce black powder igniter. The base section (zone 8B) contains 59.87 pounds of smokeless powder. The increments for zones 9 and 10 contain 12.81 and 18.56 pounds, respectively. This charge is marked with similar information to that on the M5 charge described above.

d. Propelling charge (base and increment), zone 1-8A, 1,046-pound projectile.—This is the older type of charge used for firing the 700-pound projectile. The size and weight of the several sections are as follows:

Section	Diameter (inches)	Length (inches)	Weight of charge (pounds)
Base section zone:			
1.....	9. 0	12. 125	18. 625
2.....	9. 0	12. 375	22. 625
3.....	9. 25	12. 625	27. 625
4.....	9. 875	12. 625	32. 75
5.....	10. 25	13. 250	39. 625
6.....	10. 625	13. 375	47. 75
Increment section zone:			
2.....	9. 0	1. 875	4. 0
3.....	9. 0	2. 125	5. 0
4.....	9. 25	2. 25	5. 125
5.....	9. 375	2. 625	6. 875
6.....	9. 5	3. 375	8. 125
7.....	10. 625	4. 375	9. 625
8A.....	12. 25	4. 75	10. 625

The charge may consist of a base section alone or of a base section and either one or two increment sections. Each base section is marked on the ends with the words IGNITING POWDER; and on the sides with the zone, in large figures, and the lot number in small letters and figures.

e. Propelling charge (base and increment), zone 8B-10, 700-pound projectile.—This charge is similar to the charges described in *d* above. The complete assembly (zone 10) is approximately 28.5 inches long and weighs 96.125 pounds. Dimensions and weights of the sections are as follows:

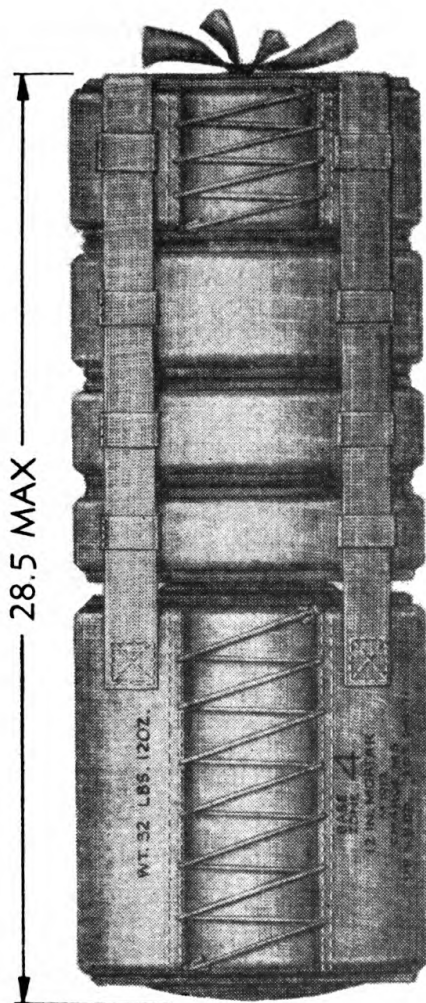
Section	Diameter (inches)	Length (inches)	Weight of charge (pounds)
Base section zone 8B.....	12. 25	20. 0	63. 375
Increment section zone:			
9.....	12. 25	4. 0	12. 9375
10.....	12. 25	4. 5	17. 8125

f. Dummy propelling charge (33-, 65-, or 85-pound), M1917.—This charge is made up of wood and lead grains assembled in a heavy cloth bag. It is used with both weights of dummy projectile. The charge is provided in three sizes to simulate charges for different zones, as follows:

Section (pounds)	Diameter (inches)	Length (inches)
33	10. 25	15. 0
65	10. 25	19. 5
85	10. 25	25. 5

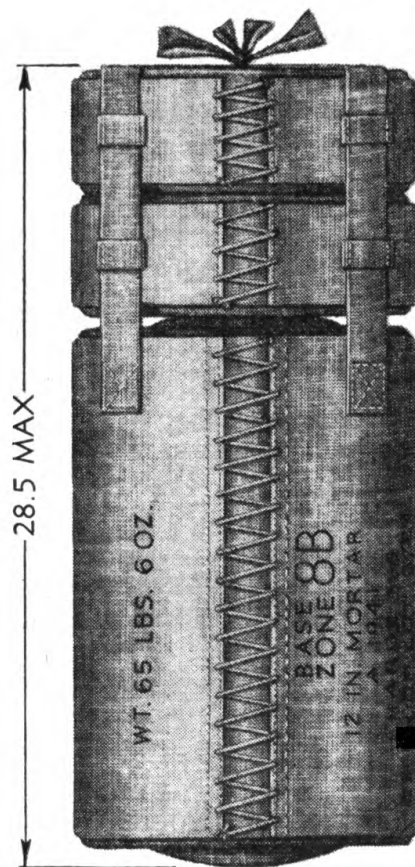
g. Dummy propelling charge (8-, 16-, 20-, and 24-pound), M1911.—This charge is made up of wood and lead grains assembled in a heavy cloth bag. It was designed to represent an aliquot part charge, since abandoned, but it may still be used—any section alone, or any combination of sections tied together—to represent service propelling charges. The dimensions of the sections are approximately as follows:

Section (pounds)	Diameter (inches)	Length (inches)
8	10. 25	3
16	10. 25	6
20	10. 25	7½
24	10. 25	9



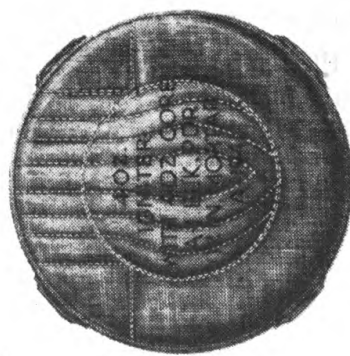
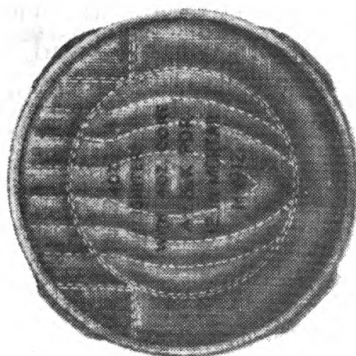
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FIGURE 35.—Propelling charge (base and increment) M5, zone 4-A, 1,046-pound projectile.



RAPD 5325

FIGURE 36.—Propelling charge (base and increment) M6, zone 8B-10, 700-pound projectile.



55. Fuze, BD, Mk. X.—*a. Description.*—This fuze is the standard delay fuze for major caliber deck-piercing projectiles. It is a mechanical device which serves to explode the projectile on impact. As shipped, the fuze is assembled to the projectile and covered by the base cover. It is therefore not visible.

b. Classification.—It is classified as a delay action fuze of the base-detonating type, signifying that it explodes the charge *after* impact and is assembled in the base of the projectile.

c. Arming.—This fuze is so designed that it is in an “unarmed” condition before firing. That is, the parts are arranged in such a way that the fuze will not function before it is acted on by forces incident to firing, in this case the centrifugal force due to the rotation of the shell. This fuze is also “boresafe.” A boresafe fuze is

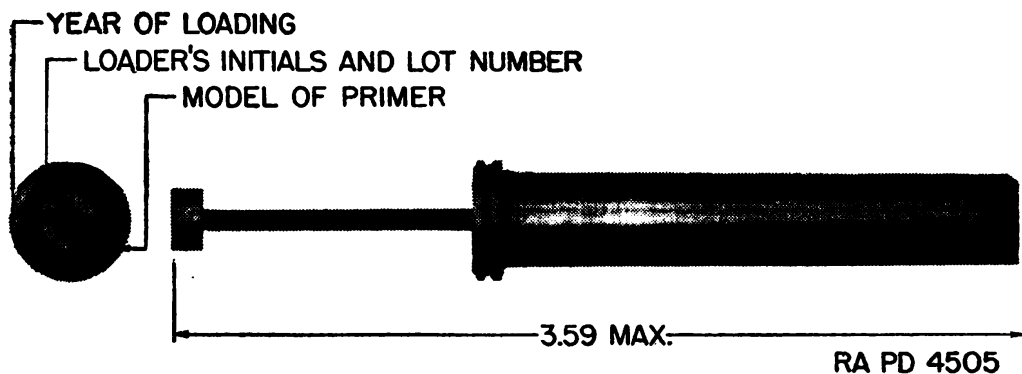


FIGURE 37.—Electric primer M30.

one in which the explosive train is so interrupted that prior to firing, and subsequent to firing, while the projectile is still in the bore of the cannon, premature action of the bursting charge is prevented should any of the more sensitive elements, primer and/or detonator, malfunction.

56. Primers.—*a. General.*—The primer is used to initiate the combustion of the propelling charge. It consists, essentially, of a small quantity of sensitive explosive and a larger quantity of black powder contained in a brass container similar in shape to a blank cartridge. The primer is designed for insertion into the breechblock and, dependent upon the type, is fired by an electric current or by friction. The symbol of the loader and the lot number of the primer are stamped on the button.

b. Electric primer M30.—This primer (fig. 37) is standard for all mortars in emplacements fitted with electrical equipment. It is fired by the heat generated by an electric current passing through a resistance wire embedded in the sensitive explosive. The black powder charge intensifies and transmits the flame to the igniter which is sewed to the propelling charge. This primer may be distinguished from the friction primer, described below, by the presence of black insulation on the wire and the presence of a groove around the head of the case. A live primer is supplied for dummy rounds; it should be fired and retained for use with the dummy ammunition.

c. Friction primer M1914.—This primer (fig. 38) is similar in appearance to the electric primer, with the above exceptions. It is used for all 12-inch mortars where electric power is not available either

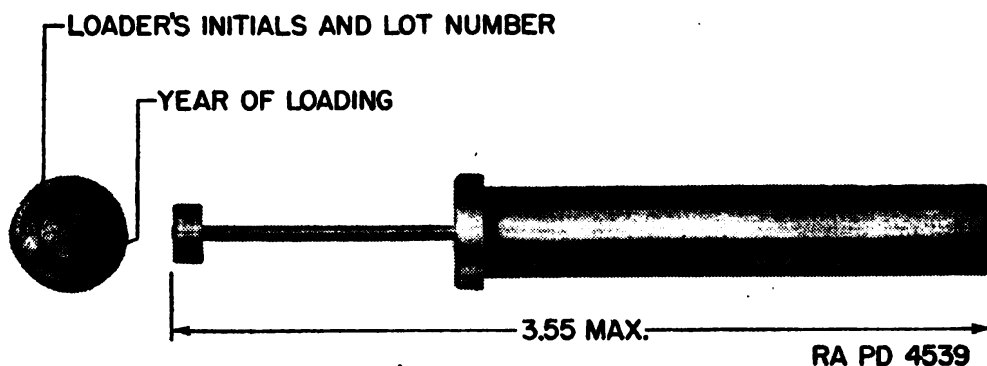


FIGURE 38.—Friction primer M1914.

from lack of facilities or from temporary power failure. It is ignited by the heat generated when a serrated plug is pulled through a powder mixture highly sensitive to friction.

57. Packing.—*a. General.*—Complete packing data covering dimensions, volume, and weight of the various components of the ammunition described herein are published in SNL P-1, P-3, P-6, and P-7. The practice projectiles for this mortar are shipped uncrated, fitted with a rope grommet; other types are fitted with grommet and packed, one per crate. Although weights of individual projectiles vary somewhat dependent upon type and model, and weights of propelling charges vary, dependent upon the particular powder charge, the following data are representative for estimating weight and volume requirements:

	Weight (pounds)	Volume (cubic feet)
12-inch projectiles as shipped:		
Deck-piercing (700-pound), packed 1 per crate.....	739	7.34
Over-all dimensions (inches): 44 $\frac{1}{8}$ by 16 $\frac{1}{8}$ by 16 $\frac{1}{8}$.		
Deck-piercing (1,046-pound), packed, 1 per crate.....	1,093	8.86
Over-all dimensions (inches): 55 $\frac{1}{8}$ by 16 $\frac{1}{8}$ by 16 $\frac{1}{8}$.		
Practice (700-pound), uncrated.....	700	4.10
Over-all dimensions (inches): 38.08 by 13.64 (diameter).		
Practice (1,046-pound), uncrated.....	1,046	5.36
Over-all dimensions (inches): 49.31 by 13.70 (diameter).		
Propelling charges as shipped: ¹		
Example: One charge, zone 8B-9-10, packed in cartridge storage case.....	148	5.47
Over-all dimensions (inches): 41 $\frac{1}{8}$ by 15 $\frac{1}{8}$ (diameter).		
Electric primer M30, packed 20 per can, 25 cans (500 primers) per box.....	43	.90
Over-all dimensions (inches): 16.65 by 16.025 by 5.625.		

¹ No wooden shipping cover is required for domestic shipment when the cartridge storage case (C. S. C.) is modified with a protecting rim. For oversea shipments, a wooden crate is required.

b. Marking.—In addition to the marking for identification described in paragraph 49, containers are marked with the shipping name of the item, addresses of consignor and consignee, shipping ticket numbers, the weight and volume of the package, and insignia indicating ownership by the Government, the War Department, and the Ordnance Department.

58. Subcaliber ammunition.—*a. General.*—Ammunition authorized for subcaliber practice with this mortar is issued in the form of fixed complete rounds. The round consists of a projectile, a brass cartridge case, propelling charge, and primer. The term “fixed” used in connection with the round signifies that the propelling charge is contained in the cartridge case which is crimped rigidly to the projectile. The projectile is a solid steel or cast iron ogival shot. An extracting rim is cut around the base of the cartridge case. The primer is pressed into the base of the cartridge case. The primer is

of the igniting type designed to be ignited by the flame from the service primer, which is fired in the breech mechanism of the mortar. The igniting primer of the subcaliber round used in this mortar contains a charge of 100 grains of black powder.

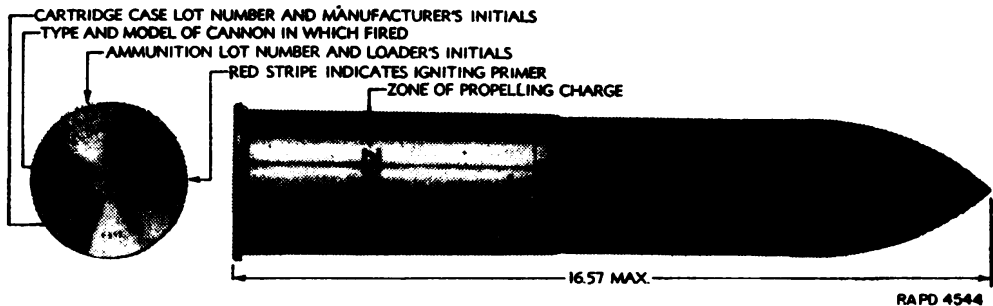


FIGURE 39.—Shot, fixed, solid, subcaliber, 2.95-inch, zone 1.

b. Characteristics of subcaliber ammunition.

Round	Length (inches)	Weight of complete round (pounds)	Weight of propelling charge (pounds)	Marking
Shot, fixed, solid, subcaliber, 2.95-inch, zone 1.	17.30	20	0.27	ZONE 1 stenciled on the side of the cartridge case.
Shot, fixed, solid, subcaliber, 2.95-inch, zone 2.	17.30	20	.31	ZONE 2 stenciled on the side of the cartridge case.
Shot, fixed, solid, subcaliber, 2.95-inch, zone 3.	17.30	20	.38	ZONE 3 stenciled on the side of the cartridge case.

c. Packing.—Subcaliber rounds for this mortar are packed in individual fiber container M49, 4 containers (4 rounds) per box; weight, 102 pounds (zone 3); volume, 1.21 cubic feet; over-all dimensions, $23\frac{1}{2}$ by $9\frac{7}{16}$ by $9\frac{7}{16}$ inches.

59. Field report of accidents.—Any serious malfunctions of ammunition must be promptly reported to the ordnance officer under whose supervision the matériel is issued and maintained (AR 45-30).

SECTION X

ORGANIZATION SPARE PARTS AND ACCESSORIES

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Shot truck.....	72
Wrenches	73

60. Organization spare parts.—Organization spare parts are supplied to the using arm for replacement of those parts most likely to become broken, worn, or otherwise unserviceable. SNL's, which ordinarily contain a list of those spare parts which should be maintained as a set, will not be published for this matériel. However, a list of the parts of the mortar which are most likely to fail and which are commonly issued to battery personnel for repair purposes is furnished below. This list is not necessarily correct for any one battery but is intended as a guide for the stocking of organization spare parts. Repair parts for the carriage must be procured and replaced by ordnance personnel. An inventory of the parts stocked at the battery should be kept at all times. The organization spare parts listed below should be drawn through the representative service command headquarters. Sets of spare parts should be maintained as complete as possible at all times and should be kept clean and oiled to prevent rust.

Organization spare parts for 12-inch mortar M1912

Piece mark or drawing number	Item
15-OK-13.....	2 bar, safety.
15-OK-13.....	3 cable, firing.
15-OK-13.....	2 catch, collar.
15-OK-13.....	3 catch, slide.
15-OK-13.....	3 clip, contact.
CLFX2B.....	6 cup, oil drive type, $\frac{3}{8}$ inch.
CLFX2C.....	2 cup, oil drive type, $\frac{1}{2}$ inch.
15-OK-13.....	2 ejector.

Organization spare parts for 12-inch mortar M1912—Continued

Piece mark or drawing number	Item
15-OK-13.....	3 housing, slide stop.
15-OK-13.....	2 insulation, circuit breaker housing.
15-OK-13.....	2 insulation, circuit breaker screw.
15-OK-13.....	2 insulation, contact clip.
15-OK-13.....	2 insulation, contact clip nut.
15-OK-13.....	2 leaf, firing.
15-OK-13.....	2 mechanism, firing, complete.
15-OK-13.....	2 nut, contact clip.
15-OK-13.....	3 nut, slide stop.
62-9-8.....	2 pad, gas check.
62-9-8.....	3 piece, circuit breaker contact.
15-OK-13.....	2 pin, circuit breaker contact.
15-OK-13.....	2 pin, firing leaf pivot.
15-OK-13.....	2 pivot, firing leaf.
62-9-8.....	3 ring, split, front.
62-9-8.....	3 ring, split, rear.
62-9-8.....	3 ring, split, small.
15-OK-13.....	3 screw, circuit breaker.
15-OK-13.....	2 screw, collar catch.
15-OK-13.....	3 screw, firing leaf spring.
15-OK-13.....	2 slide.
15-OK-13.....	3 spring, circuit breaker contact.
62-9-8.....	3 spring, clip.
15-OK-13.....	3 spring, firing leaf.
62-9-8.....	3 spring, obturator spindle.
15-OK-13.....	3 spring, slide catch.
15-OK-13.....	3 spring, slide stop.
62-9-7.....	3 spring, tray latch.
15-OK-13.....	3 stop, slide.
62-9-7.....	3 stud, tray latch operating.
15-OK-13.....	2 terminal, firing cable.

61. Accessories.—*a.* Accessories include tools and equipment required for such disassembling and assembling as the using arm is authorized to perform, and for the cleaning and preserving of the mortar, carriage, ammunition, etc. They also include chests, covers, tool rolls, and other items necessary to protect the matériel when it is not in use. Additional accessories and supplies of a general nature are provided for battery use. Accessories should not be used for purposes other than as prescribed, and when not in use should be properly stored.

b. There are a number of accessories whose names or general characteristics indicate their use. Others, embodying special features or having special uses, are described below.

62. Primer flame baffle.—This is a small plate which fits over the vent hole in back of the mushroom head of the obturator spindle. It is used when firing primers for test purposes to avoid fouling the bore of the mortar. It is stored in the same chest with the subcaliber equipment. To install the baffle proceed as follows: Remove dummy pressure plugs, attach baffle, and replace plugs to retain the baffle on the obturator head. Fire the primers. Remove baffle plate and replace plugs. Clean the vent holes and primer seat.

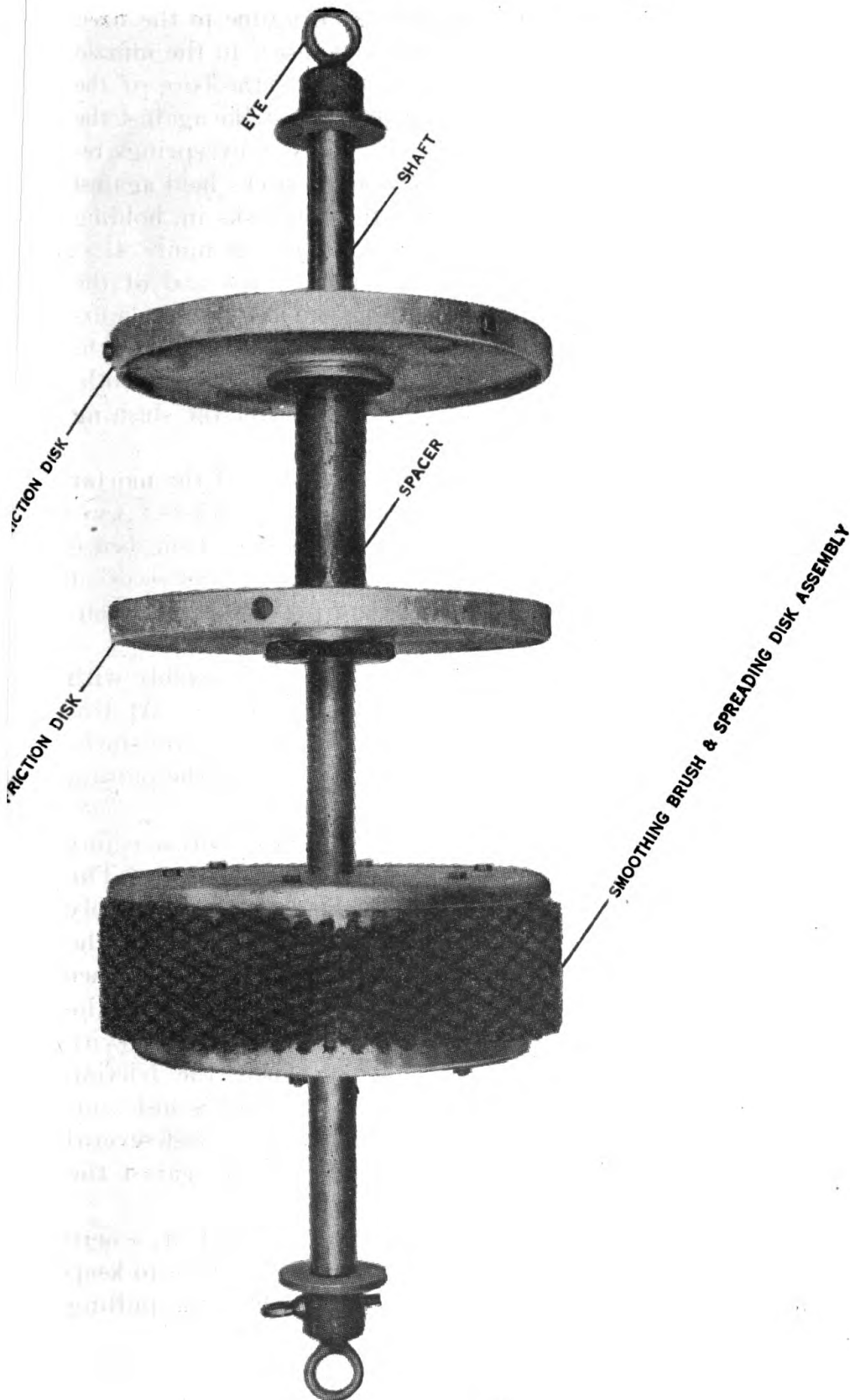
63. Artillery gun book.—The gun book (O. O. Form 5825) is used to keep an accurate record of the matériel, and remains with the piece regardless of where it may be sent. It includes records of assignments, the battery commander's daily record, and the inspector's record of ammunition, as well as forms to be filled out in case of premature explosions. This book should be in the possession of the organization at all times. The completeness of the record and the whereabouts of the book are the sole responsibility of the organization commander. It must also contain the date of issuance of the matériel, to and by whom issued, and the place where issued. If a new cannon is installed on the carriage, all data in the old book with reference to sights, carriage, etc., must be copied into the new gun book before the old gun book is relinquished.

64. Slush brush.—The spiral bristle brush with bronze shank is used in oiling the bore.

65. Covers.—*a.* The muzzle cover is made of sheet metal. It is felt padded and duck lined and designed to fit over the muzzle for its protection when the mortar is not in use.

b. The breech cover is made of olive-drab cotton duck and designed to fit over the breech of the mortar for its protection when not in use.

66. 12-inch bore-greasing device M4.—*a. Description.*—The bore-greasing device (fig. 40) consists of three parts: two friction disks assembled to a spacer; a smoothing brush and spreading disk assembly; and a shaft fitted with an eye on each end. The friction disks serve as guides. They keep the shaft centered and parallel to the bore of the mortar. This, in turn, centers the slushing compound spreading disk, which is assembled to the brush assembly, and insures an even pressure of brush bristles against the bore of the mortar. The friction device and brush assembly are free to slide on the shaft.



RA PD 5970

FIGURE 40.—12-inch bore-greasing device M4.

b. Method of slushing bore.—(1) Attach the dragline to the fixed eye on the shaft of the bore-slushing device and insert in the muzzle end of the mortar. As the first friction disk enters the bore of the mortar, the studs in the rim of the disk (fig. 40) will strike against the muzzle face of the mortar. These studs are held out by springs recessed in the disk. Compress the studs by wooden sticks held against their ends and insert both disks. Push the friction disks in, holding the shaft, until the device is in the position shown in figure 41(3), that is, with the friction disk assembly to the extreme end of the shaft and the other end of the shaft extending out beyond the muzzle face of the mortar a distance equal to the thickness of the smoothing brush and spreading disk assembly. This will allow the smoothing brush and spreading disk assembly to be fitted after the slushing compound has been applied.

(2) Pack the slushing compound in the muzzle end of the mortar (fig. 41(4)), taking care to pack solid with no air pockets. Care should also be taken to prevent the bore-slushing device from being pushed breechward during this operation. In some instances it may be necessary to hold the shaft in order to prevent this breechward movement.

(3) Install the smoothing brush and spreading disk assembly with spreading disk next to the slushing compound (fig. 41(5)). At this point, coat the brush bristles with slushing compound to insure slushing of the first few inches of the bore at the beginning of the pulling operation.

(4) By means of the dragline (fig. 41(6)) pull the bore-slushing device and slushing compound through the bore of the mortar. The force of the pull is exerted on the brush and spreading disk assembly which pushes the slushing compound and friction disks through the bore. Pressure is built up against the compound by the resistance of the friction disks, causing the compound to ooze out around the spreading disk and fill the grooves. After the bore-slushing device has been drawn through the bore to the point where the friction disks enter the chamber, pressure against the compound is lost and, to compensate for this loss of resistance and to slush the last several inches of rifling, it is necessary to hold a pole or staff against the friction disk.

(5) The pull on the dragline may be applied by hand or, where space will permit, by a tractor. Care should always be taken to keep the direction of pull along the axis of the bore. Once the pulling

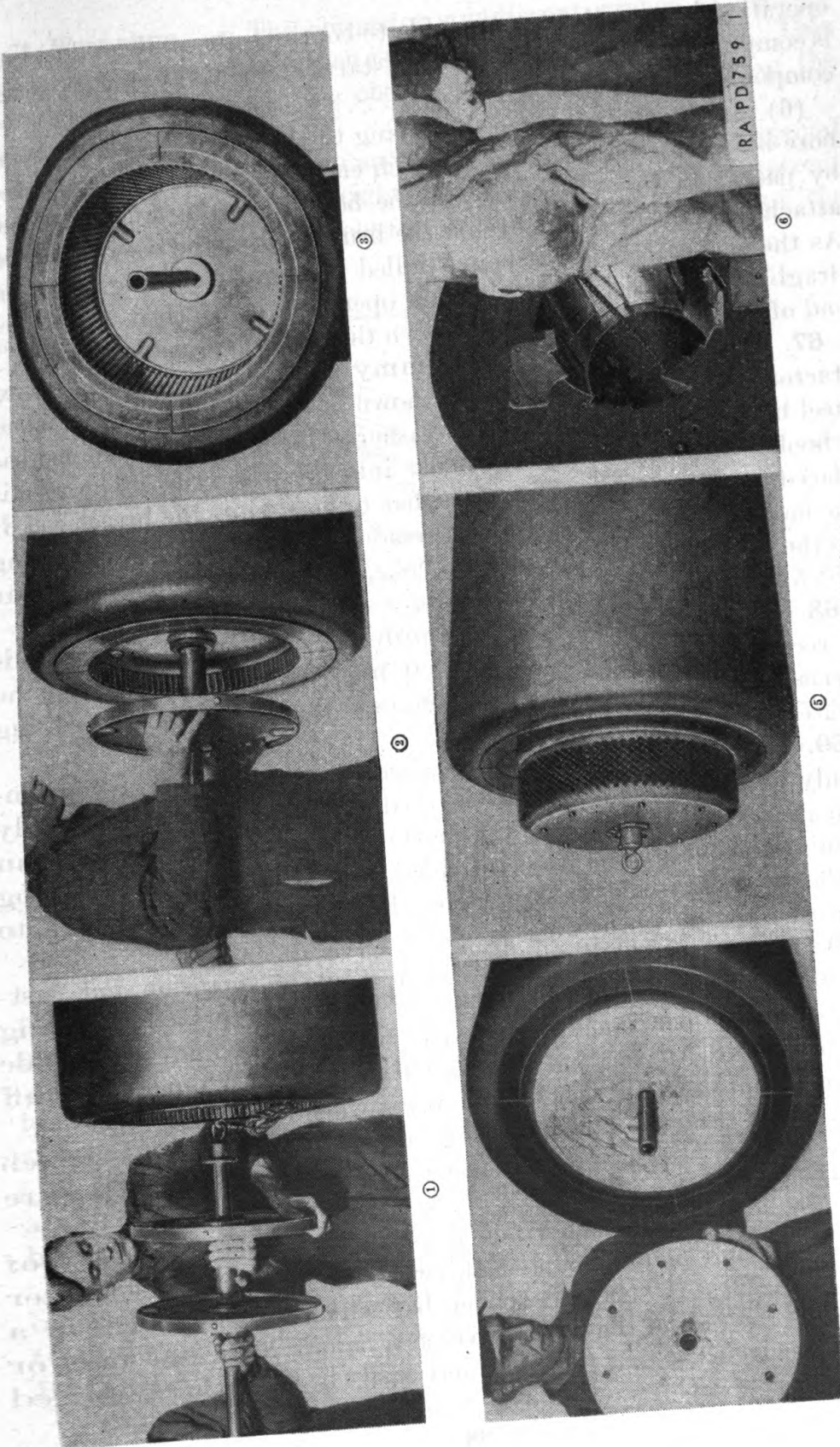


FIGURE 41.—Method of slushing bore.

operation is started, it is desirable to continue the pull until the bore is completely slushed; each stop and start leave a heavy ring of slushing compound in the bore.

(6) An alternate method of placing the bore-slushing device in the bore is to draw it in from the breech end. This can be accomplished by passing a light line through the bore from the muzzle end and attaching the line to the eye on the brush end of the slushing device. As the slushing device is being pulled through by the light line, the dragline to be used in the slushing operation is attached to the other end of the slushing device and drawn through at the same time.

67. Power extractor, for dummy projectiles.—The power extractor (similar to gun extractor shown in fig. 46) consists of a round steel bar, a yoke, and a nut and washer. The bar is tapered and has a hook on its larger end that hooks into the projectile. The yoke is placed over the smaller end of the bar to fit against the breech end of the mortar. The smaller end is threaded for the nut and by screwing up the nut on the bar against the yoke, pressure is applied to the bar which loosens the dummy projectile.

68. Drip pan.—Drip pans are provided for use on the lower ends of recoil cylinders to catch oil that might soak through when the carriage is not in use or while followers in the stuffing boxes are being tightened.

69. Rammer and staff.—The assembled rammer and staff is commonly called the rammer. It is used to ram the projectile firmly into its seat in the bore of the mortar. The rammer proper is an aluminum, cone-shaped head provided with a coupling for fastening to the staff. A scale is marked on the cylindrical wooden staff to indicate when the projectile is properly seated in the bore.

70. Scraper.—The scraper is used to scrape corrosion and rust-preventive compound from the bore of the mortar prior to cleaning and slushing operations. It consists of a semicircular steel blade which is secured to one end of a socket with a bronze nut. The staff is screwed into the other end of the socket when required.

71. Shot tongs.—The shot tongs are a pair of steel hooks which are designed to grip the projectile near its center of gravity. They are used to load the shot truck.

72. Shot truck.—Each truck consists of a light framework of steel angles and plates mounted on two truck wheels and one caster wheel (fig. 42). A straight wooden bar which fits into sockets in a bracket at the rear of the truck serves as a handle. The rear wheel or caster is swiveled so that the truck may easily be turned in any desired direction.

73. Wrenches.—*a.* The obturator spindle nut wrench (1, fig. 45) is a special box wrench to which is attached a T-shaped handle. This wrench is used to tighten the obturator nut on the rear end of the obturator spindle.

b. The obturator nut clamp screw wrench (2, fig. 45) is a special box wrench. It is used for tightening the clamp screw to prevent accidental loosening of the obturator nut on the rear end of the obturator spindle.

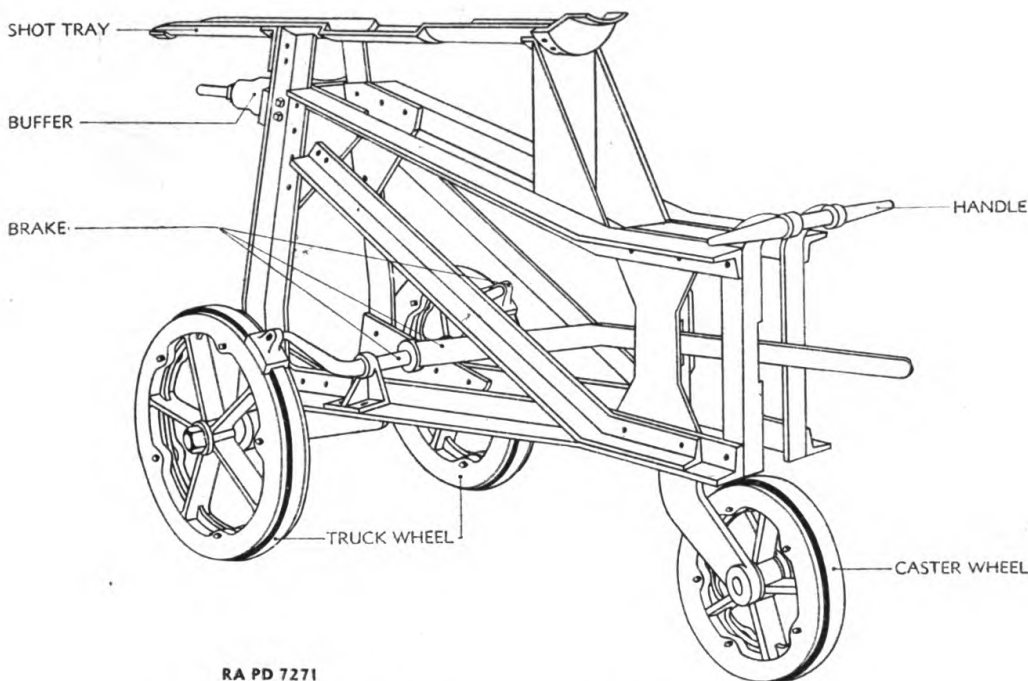


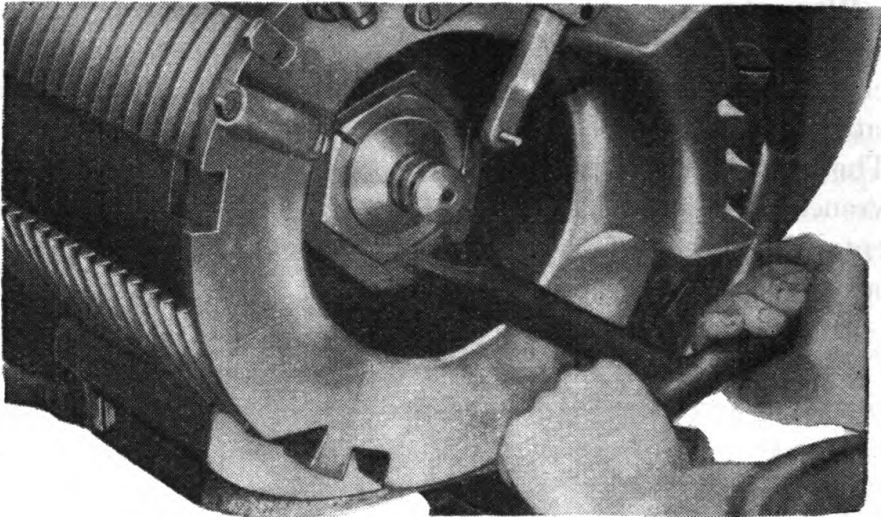
FIGURE 42.—12-inch mortar carriage M1896MIII—shot truck.

c. The wrench for the obturator spindle plate (2, fig. 45) is a flat piece of forged steel, at one end of which are two pins which fit in holes on the obturator spindle plate.

d. The pressure plug wrench (4, fig. 45) is a box wrench (1.52-inch hexagonal) with a handle $13\frac{7}{8}$ inches long. It is used on the pressure plugs in the obturator.

e. The wrench (5, fig. 45) for screw drivers is a round steel rod with an enlarged section at its midpoint in the center of which is a square hole. It is used with large bar screw drivers.

f. The gland wrench (6, fig. 45) is a flat piece of steel on one end of which is a small right-angle bend. At the same end a slot is cut to fit the gland nut. It has stamped on one side LAMP JUNCTION BOX GLAND.



RA PD 10775

FIGURE 43.—Method of removing obturator spindle nut.

g. The lower follower spanner wrench (7, fig. 45) is a Y-shaped steel hook spanner type wrench. The two hooks at the Y-end fit into notches of the recoil cylinder follower. At the other end is a hole through which the rod may be inserted half-way to form a handle. The wrench is used to remove the follower at lower end of recoil cylinder.

h. The piston rod nut wrench (8, fig. 45) is a single end wrench used on the two nuts on the front end of the piston rod when the piston rod is removed from the recoil cylinder.

i. The spring rod nut wrench (9, fig. 45) is a double end wrench used on the spring guide rod nuts in the counterrecoil springs.

SECTION XI

SUBCALIBER EQUIPMENT

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Care and maintenance	78

74. Purpose.—Subcaliber equipment is used for training purposes only, to provide practice in laying and firing the 12-inch mortar matériel. The use of smaller bore ammunition prevents wear on the regular piece during practice and is less costly. Although the handling and loading, as well as the range obtained, differ from those of the

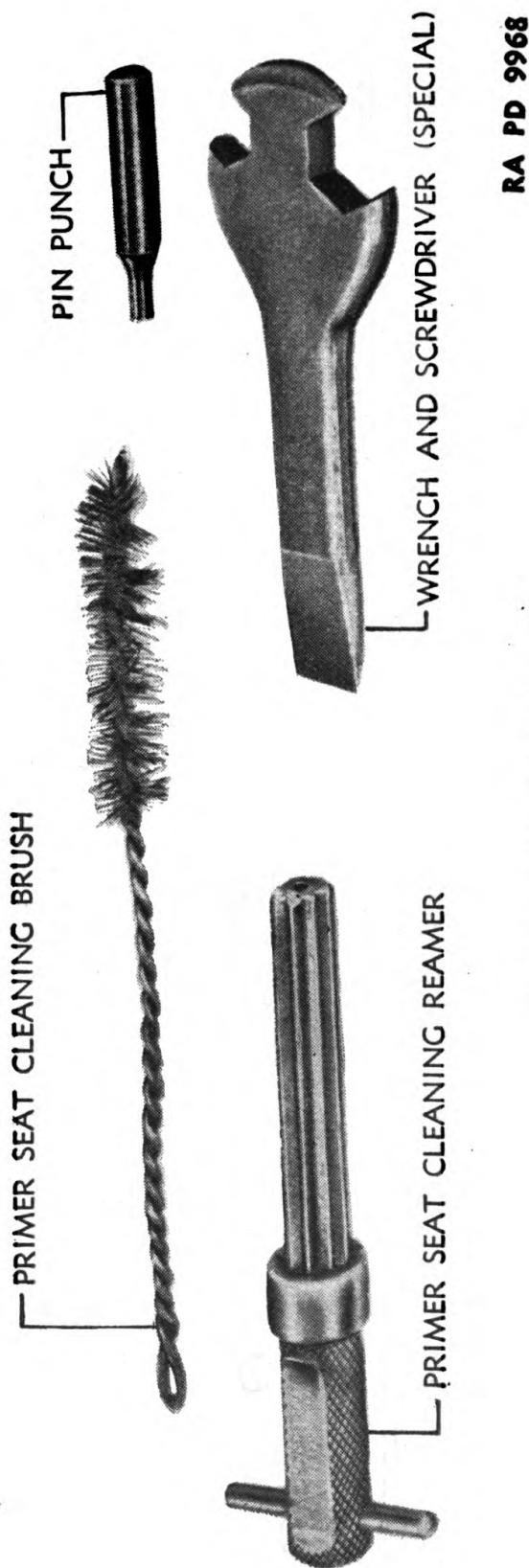


FIGURE 44.—Tools for firing mechanism.

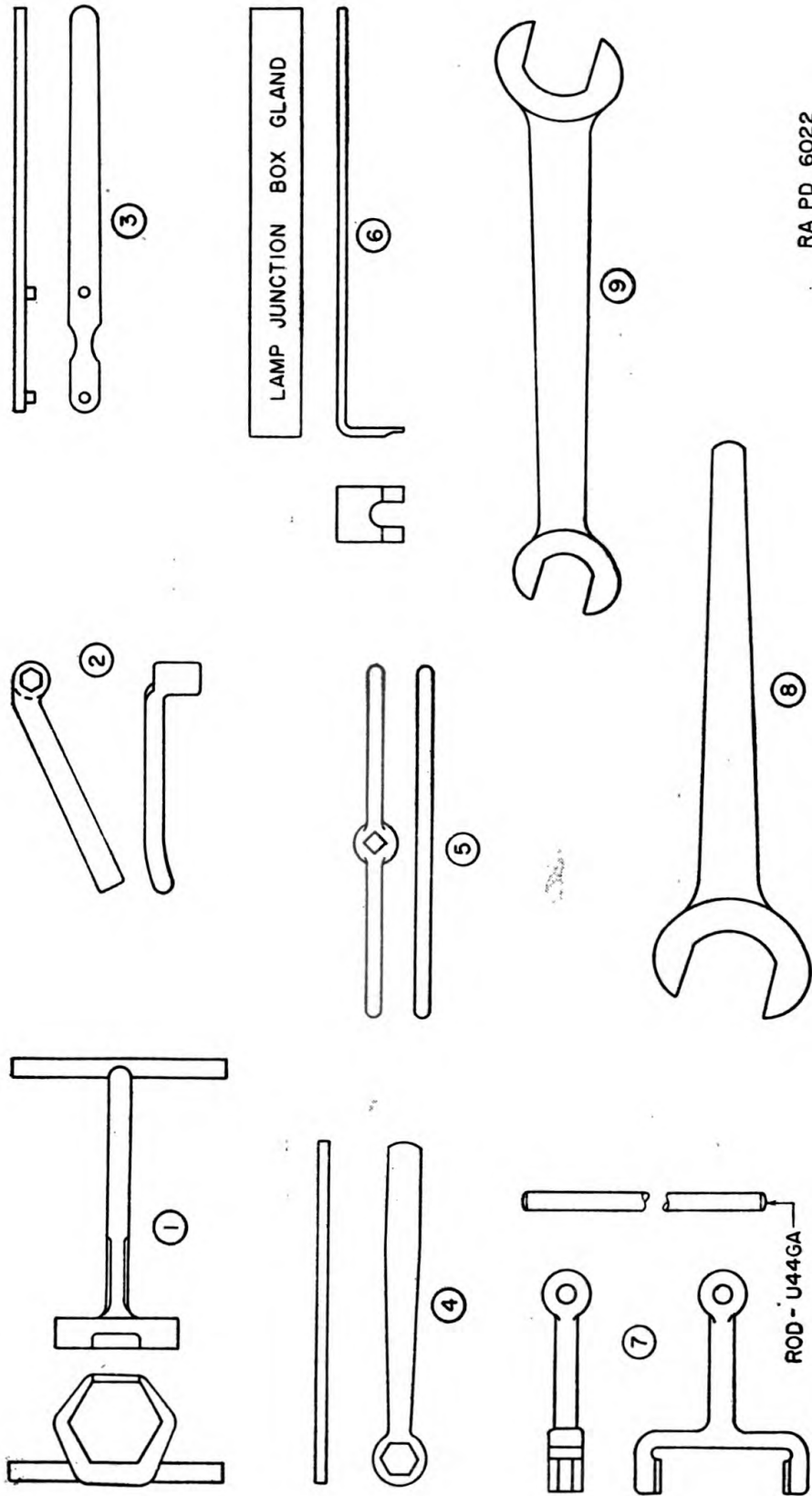


FIGURE 45.—Wrenches.

RA PD 6022

regular piece, the elevating, traversing, sighting, etc., are adequate for purposes of instruction.

75. Matériel.—The subcaliber equipment is stored in a chest which contains the following:

- 1 2.95-inch subcaliber gun.
- 1 front adapter.
- 1 rear adapter.
- 1 primer flame baffle.
- 1 oil can.
- 1 clip extractor.
- 1 gun extractor complete.
- 1 hand extractor.
- 1 locating gage.
- 1 handspike.
- 1 obturator spindle plate.
- 1 sponge rod.
- 1 clamp wedge screw.
- 2 securing screws.
- 2 thread clamp screws.
- 1 cleaning sponge.
- 1 adapter clamp wedge.
- 1 adjusting wrench.
- 1 clamping wrench.
- 1 securing screw wrench.

a. Rear adapter.—The rear adapter (fig. 47) is the rear support of the subcaliber gun in the bore of the mortar. The adapter clamp wedge is inserted in an opening of the rear adapter and then is forced against the chamber wall of the mortar by screwing in the clamp wedge screw.

b. Clip extractor.—The clip extractor (fig. 46) is used when an empty cartridge case sticks and cannot be removed with the hand extractor. It has three claws that fit over the rim of the subcaliber cartridge case. Back of the claws is an eye. A light rope may be passed through the eye of the extractor and, if necessary, the rope may be wrapped around a lever against the face of breech.

c. Hand extractor.—The hand extractor (fig. 46) is used on the flange or rear adapter of the subcaliber gun in case the gun should stick in its seat.

d. Gun extractor.—The gun extractor (fig. 46) is used as a puller for removing the subcaliber gun from the bore of the mortar.

e. Locating gage.—The locating gage (fig. 46) is a U-shaped clamp with set screw used to locate the subcaliber gun in the bore of the mortar.

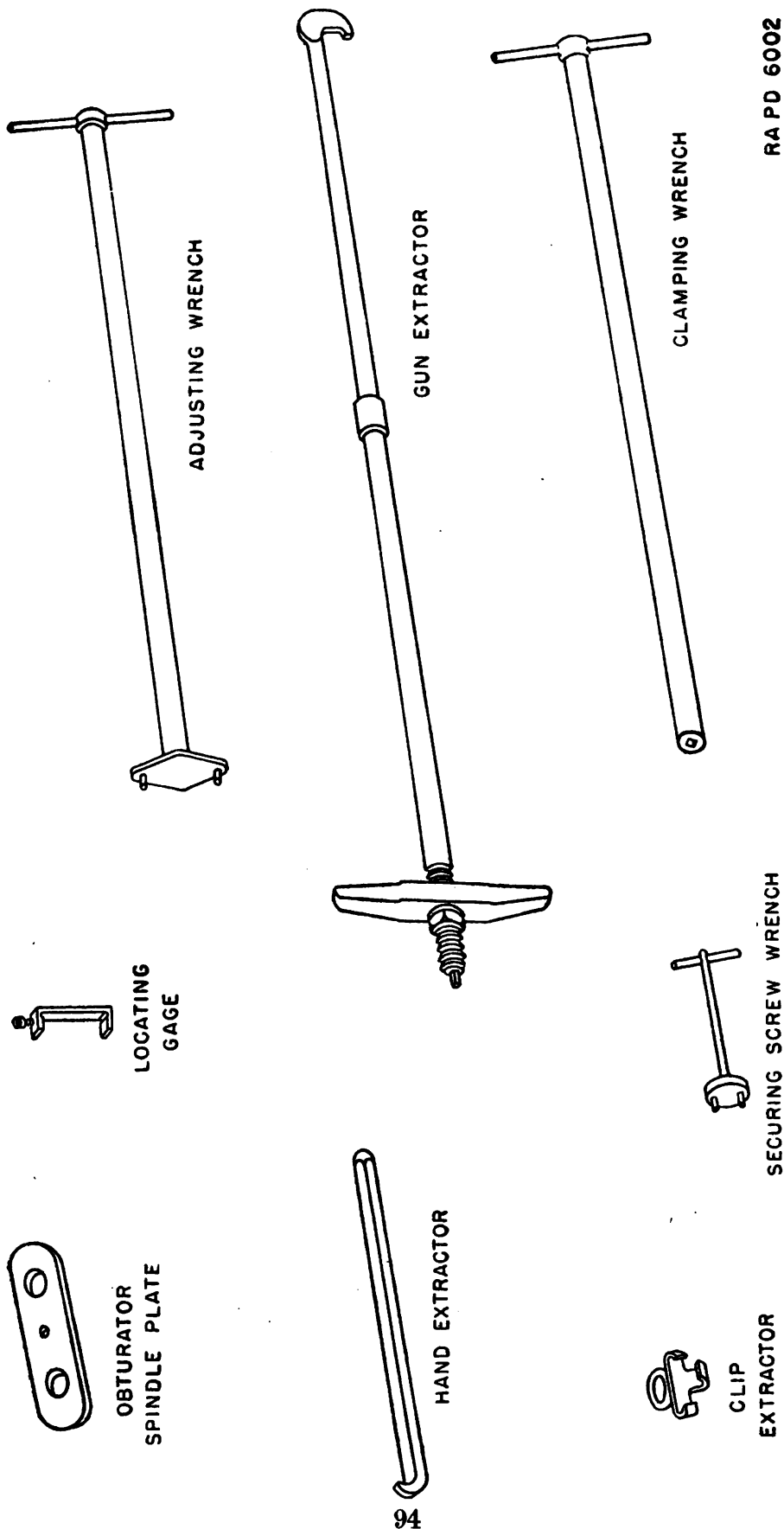


FIGURE 46.—Tools for subcaliber gun.

The gage is slipped over the obturator spindle plate, leaving a space between gage and spindle plate, and the breech is closed gently. If resistance is encountered, the subcaliber gun is too far to the rear. The breech is opened and the subcaliber gun turned clockwise. If no resistance is encountered in closing, the breech is opened to note whether the gage has been pushed back against the spindle plate. If the gage has not been pushed all the way back, the subcaliber gun is unscrewed one turn for each 0.1 inch. This is kept up until the gage is pushed just against the spindle plate when closing breech. The thread clamp screw is tightened to prevent subcaliber gun from turning.

f. Subcaliber gun, 2.95 inch.—This gun is a tube 31.6 inches long which has a bore of 2.95 inches. It is supported in the bore of the mortar by two supports (the rear and front adapters).

g. Adapter clamp wedge.—The adapter clamp wedge (fig. 47) is a steel wedge used to wedge the rear adapter tightly against the walls of the chamber of the mortar.

h. Wrenches.—(1) The securing screw wrench (fig. 46) is used to tighten the two securing screws of the obturator spindle plate. It is a small wrench which consists of a T-shaped handle attached to a steel plate which has two steel pins that fit into two small holes in the securing screw.

(2) The clamping wrench (fig. 46) consists of a steel cylindrical rod on one end of which is a T-shaped handle. A square opening in the center of the other end fits the clamping screw. The clamping wrench is used to tighten the clamp wedge screw in the rear adapter, which in turn causes the rear adapter to be wedged against the walls of the chamber.

(3) The adjusting wrench (fig. 46) is a cylindrical steel rod with a T-shaped handle at one end and a steel plate with two pins attached at the other. This wrench in general appearance resembles the securing screw wrench, but it is much larger and is used with the locating gage in adjusting the subcaliber gun in the bore of the mortar.

76. Installing subcaliber tube.—To mount the subcaliber gun in the bore of the mortar proceed as follows:

a. Installation.—Chamber and bore of subcaliber gun and of mortar must be perfectly clean. Remove pressure plugs from mushroom head and put on obturator spindle plate with its two screws, tightening with the securing-screw wrench. Screw the front and rear adapters onto the tube. Insert the subcaliber tube into the mortar chamber, pushing it smartly forward with the handspike to cause front adapter to seat

firmly in the tapered port of the chamber. Using the clamping wrench, tighten clamp wedge screw in rear adapter to cause adapter clamp wedge to expand adapter against the walls of chamber. Remove handspike.

b. Adjustment.—The subcaliber tube is in correct adjustment when the locating gage is pushed just against the obturator spindle plate when the mortar breech is closed. To adjust, slip locating gage over obturator spindle plate, leaving a space between gage and spindle plate. Close breech gently. If resistance between the mortar breech and subcaliber tube is encountered, the tube is too far to the rear. Open breech and turn the tube clockwise. If it has not been pushed all the way back, measure the distance between plate and gage and unscrew the tube one turn for each 0.1 inch. Continue to try in this manner until gage is pushed just against spindle plate when closing the breech. Having adjusted subcaliber gun until locating gage is pushed against spindle plate by closing breech, tighten thread clamp screw with clamping wrench to prevent subcaliber gun from turning. The gun is then ready to fire.

c. Disassembly.—Ease up both clamp screws, insert handspike, lift on handspike to support the weight, and pull subcaliber gun to rear and out; if not easily withdrawn, use gun extractor.

77. Operation.—*a.* Operation of the subcaliber gun is identical with operation of the mortar except that powder and projectile are not loaded separately because the subcaliber ammunition is in the form of fixed complete rounds.

b. To load the gun—

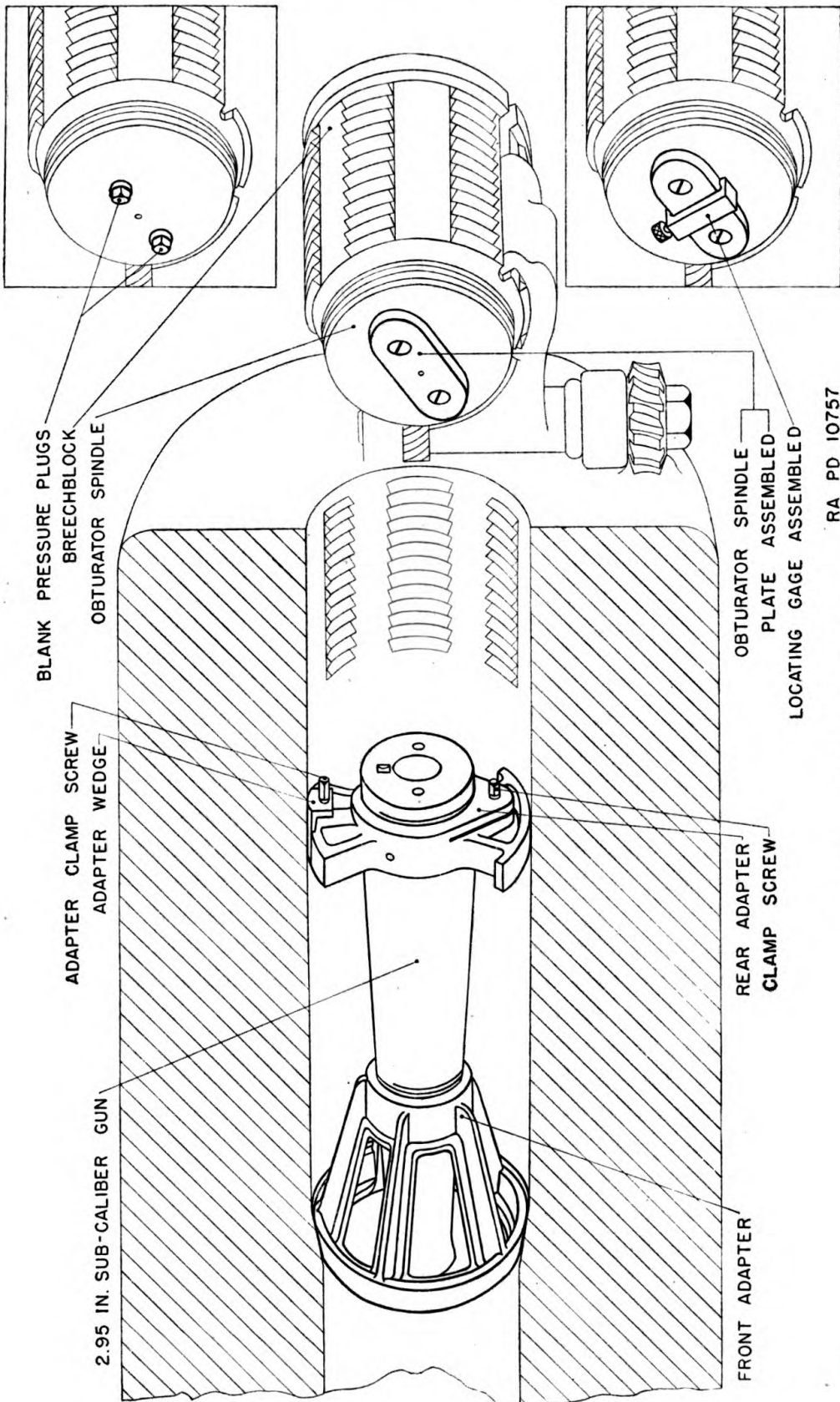
- (1) Depress the mortar to zero elevation.
- (2) Insert a round and impel it into the chamber.
- (3) Close the breech.

c. To fire the gun—

(1) Elevate the mortar, as with the regular ammunition and fire, observing the same precautions as are observed for firing the mortar.

(2) Remove empty cartridge case after each round with the hand extractor. If the empty cartridge case sticks when the limit of extraction given by hand extractor is reached, use the clip extractor. A light rope may be passed through the eye of this extractor and, if necessary, the rope may be wrapped around a lever placed against face of the breech.

d. After one or two rounds the position of the locating gage should be checked to insure that the gun has not moved forward. Any fouling of vent in obturator must be removed with vent cleaner.



RA PD 10757

FIGURE 47.—2.95-inch subcaliber gun assembled.

78. Care and maintenance.—Care should be taken in assembling and disassembling. Special care should be taken to prevent the outside surfaces of the adapters from coming in contact with any hard substance. If a bur should appear it must be smoothly filed down before assembling. Particular care must be taken in loading not to drive the point of the shell against the edge of the chamber of the subcaliber gun. The clamp screws and adapter hubs should always be kept well oiled. An oil can is provided for this purpose. After firing, the bore of the subcaliber gun should be thoroughly sponged with warm soapsuds and dried. The chamber and bore of the mortar should also be thoroughly cleaned and dried.

SECTION XII

PAINTING

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Painting metal surfaces	81
Removing paint	82
Painting lubricating devices	83

79. General.—*a.* Paint is used for preservation against rust, deterioration, and decay of metals and woods. Some paints adhere to metal surfaces better than others, the liquids of the first or base coat seeming to penetrate very minute depressions or pits in the metal or to etch themselves into the surface and thus form a good bond for following coats. Paints stored in large containers should be well stirred before transfer to small containers.

b. (1) All parts of the mortar and mortar carriage will be painted with the exception of wearing or bearing parts and sliding surfaces. Groups normally considered to be wearing or bearing parts and sliding surfaces are—

- All parts of breechblock.
- Face of the breech.
- Interior of the breech recess.
- Bore and powder chamber.
- Trays, both steel and bronze.
- Square ends of shafts.
- Teeth of all gears.
- Rollers and surfaces on which rollers travel.
- Piston rods.
- Cross-head guides.

12-INCH SEACOAST MATÉRIEL

Handles of cranks, handwheels and clutches.

Azimuth and elevation scales and pointers.

Followers of stuffing boxes.

Lanyard safety pawls.

(2) The background of name and direction plates will be painted red, but the raised portions of the letters, figures, arrows, and rims are to be kept bright and free from paint. Name plates should never be removed from the carriage.

c. All paint should be well stirred before using. If too thick, it should be thinned with turpentine or thinner, but not to such an extent that the paint does not cover. The exact and proper thickness of each paint can be learned only by experience. If too thin, it often cracks in drying, and if too thick it becomes blistered, wrinkled, and unequal. The first coat may, however, be much thinner than any of the succeeding coats.

d. Ordnance matériel is ordinarily given one maintenance coat per year. With but few exceptions this matériel will be painted with lusterless olive-drab, synthetic enamel. The enamel may be applied over old coats of long oil enamel and oil paint previously issued by the Ordnance Department if the old coat is in satisfactory condition for repainting. This enamel is used for both metal and wood surfaces, the primer base coat for metal being different from that for wood (par. 80).

e. Paints and enamels are usually issued ready for use and are applied by brush or spray. They may be brushed on satisfactorily when used unthinned in the original package consistency or when thinned no more than 5 percent by volume with thinner. The enamel will spray satisfactorily when thinned with 15 percent by volume of thinner. (Linseed oil must not be used as a thinner, since it will impart a luster not desired in this enamel.) If sprayed, it dries hard enough for repainting within $\frac{1}{2}$ hour and dries hard in 16 hours.

f. Certain exceptions to the regulations concerning painting exist. Fire-control instruments, sighting equipment, and other items which require a crystalline finish will not be painted with olive-drab enamel.

g. Complete information on painting is contained in TM 9-850.

80. Preparing for painting.—a. If the base coat on the matériel is in poor condition, it is more desirable to strip the old paint from the surface than to use sanding and touch-up methods. After stripping, it will then be necessary to apply a primer coat.

b. Synthetic ground primer should be used on wood as a base coat for synthetic enamel. It may be applied either by brushing or spray-

ing. It will brush satisfactorily as received, or after the addition of not more than 5 percent by volume of thinner. It will dry enough to touch in 30 minutes, and hard in 5 to 7 hours. For spraying, it may be thinned with not more than 15 percent by volume of thinner. Rust-inhibiting lacquers must not be applied to the synthetic ground primer within less than 48 hours.

c. Synthetic primer for bare metal should be used on metal as a base coat. Its use and application are similar to those of synthetic ground primer.

d. The success of a job of painting depends partly on the selection of a suitable paint, but also largely upon the care used in preparing the surface prior to the painting. All parts to be painted should be free from rust, dirt, grease, kerosene, oil and alkali, and must be dry and smooth.

81. Painting metal surfaces.—If metal parts are in need of cleaning, they should be washed in a liquid solution consisting of $\frac{1}{2}$ pound of soda ash in 8 quarts of warm water, or an equivalent solution, then rinsed in clear water and wiped thoroughly dry. Wood parts in need of cleaning should be treated in the same manner, but the alkaline solution must not be left on for more than a few minutes, and the surfaces should be wiped dry as soon as they are washed clean. When artillery is in fair condition and only marred in spots, the bad places should be touched with lusterless olive-drab synthetic enamel and permitted to dry. The whole surface will then be sandpapered with flint paper No. 1 and a finish coat of lusterless olive-drab synthetic enamel applied and allowed to dry thoroughly before the matériel is used. If the equipment is in bad condition, all parts should be thoroughly sanded with flint paper No. 2 or equivalent, given a coat of synthetic ground primer and permitted to dry for at least 16 hours. They will then be sandpapered with flint paper No. 00, wiped free of dust and dirt, and a final coat of lusterless olive-drab synthetic enamel applied and allowed to dry thoroughly before the matériel is used.

82. Removing paint.—After repeated paintings, the paint may become so thick as to crack and scale off in places, presenting an unsightly appearance. If this happens, remove the old paint as follows: Dissolve 1 pound of caustic soda (lye) in 6 pints of hot water and add enough lime to give the solution the consistency of paint. Use the solution freshly mixed and apply to parts where paint is to be removed with a swab of cotton rags or cotton waste tied to the end of a stick. When the solution begins to dry on the surface, use a scraper to remove the old paint and complete the clean-

ing of the surface with a mop and water. If one application is not sufficient to loosen the paint, apply a second coat. If a lime-and-lye solution is not available, paint and varnish remover may be used. It is important that every trace of lye or other paint remover be completely rinsed off and that the equipment be perfectly dry before repainting is attempted. It is preferable that the use of lye solutions be limited to iron or steel parts. If used on wood, the lye solution must not be allowed to remain on the surface for more than a minute before being thoroughly rinsed off and the surface wiped dry with rags. Crevices or cracks in wood should be filled with putty and the wood sandpapered before refinishing.

83. Painting lubricating devices.—Oil cups, grease fittings, oil holes, and similar lubricating devices, as well as a circle about $\frac{3}{4}$ -inch in diameter at each point of lubrication, will be painted with water-resisting red enamel in order that they may be readily located.

SECTION XIII

MATÉRIEL AFFECTED BY GAS

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84. Protective measures.—*a.* When matériel is in constant danger of gas attack, unpainted metal parts will be lightly coated with engine oil. Instruments are included among the items to be protected by oil from chemical clouds or chemical shells, but ammunition is excluded. Care will be taken that the oil does not touch the optical parts of instruments or leather or canvas fittings. Matériel not in use will be protected with covers as far as possible. Powder will be kept in sealed containers.

b. Ordinary fabrics offer practically no protection against mustard gas or lewisite. Rubber and oilcloth, for example, will be penetrated within a short time. The longer the period during which they are exposed, the greater the danger of wearing these articles. Rubber boots worn in an area contaminated with mustard gas may offer a grave danger to men who wear them several days after the bombardment. Impermeable clothing will resist penetration more than an hour, but should not be worn longer than this.

85. Cleaning.—*a.* All unpainted metal parts of matériel that have been exposed to any gas except mustard and lewisite must be cleaned as soon as possible with dry-cleaning solvent or denatured alcohol and

wiped dry. All parts should then be coated with engine oil (except fire-control equipment). Clean all shiny exterior surfaces, the bore, the breech chamber, and the parts of the breech mechanism.

b. Ammunition which has been exposed to gas must be thoroughly cleaned before it can be fired. To clean ammunition use noncorrosive decontaminating agent or, if this is not available, strong soap and cool water. After cleaning, wipe all ammunition dry with clean rags. Do not use dry powdered decontaminating agent (chloride of lime) (used for decontaminating certain types of matériel on or near ammunition supplies), as flaming occurs through the use of chloride of lime on liquid mustard.

86. Decontamination.—For the removal of liquid chemicals (mustard, lewisite, etc.) from matériel, the following steps should be taken:

a. *Protective measures.*—(1) For all these operations a complete suit of impermeable clothing and a service gas mask will be worn. Immediately after removal of the suit, a thorough bath with soap and water (preferably hot) must be taken. If any skin areas have come in contact with mustard, if even a very small drop of mustard gets into the eye, or if the vapor of mustard has been inhaled, it is imperative that complete first-aid measures be given within 20 to 30 minutes after exposure. First-aid instructions are given in TM 9-850 and FM 21-40.

(2) Garments exposed to mustard will be decontaminated. If the impermeable clothing has been exposed to vapor only, it may be decontaminated by hanging in the open air, preferably in sunlight for several days. It may also be cleaned by steaming for 2 hours. If the impermeable clothing has been contaminated with liquid mustard, steaming for 6 to 8 hours will be required. Various kinds of steaming devices can be improvised from materials available in the field.

b. *Procedure.*—(1) Commence by freeing matériel of dirt through the use of sticks, rags, etc., which must be burned or buried immediately after this operation.

(2) If the surface of the matériel is coated with grease or heavy oil, this grease or oil should be removed before decontamination is begun. Dry-cleaning solvent or other available solvents for oil should be used with rags attached to ends of sticks. Following this, decontaminate the matériel with bleaching solution made by mixing one part decontaminating agent (chloride of lime) with one part water. This solution should be swabbed over all surfaces. Wash off with water, dry, and oil all surfaces.

(3) All unpainted metal parts and instruments exposed to mustard or lewisite must be decontaminated with noncorrosive decontaminating

agent mixed one part solid to 15 parts solvent (acetylene tetrachloride). If this is not available, use warm water and soap. Bleaching solution must not be used because of its corrosive action. Instrument lenses may be cleaned only with lens tissue paper, using a small amount of ethyl alcohol. Coat all metal surfaces lightly with engine oil.

(4) In the event decontaminating agent (chloride of lime) is not available, matériel may be temporarily cleaned with large volumes of hot water. However, mustard lying in joints or in leather or canvas webbing is not removed by this procedure and will remain a constant source of danger until the matériel can be properly decontaminated. All mustard washed from matériel in this manner lies unchanged on the ground and it is necessary to mark the contaminated area plainly with warning signs before abandonment.

(5) The cleaning or decontaminating of matériel contaminated with lewisite will wash arsenic compounds into the soil, poisoning any water supplies in the locality for either men or animals.

(6) Leather or canvas webbing that has been contaminated should be scrubbed thoroughly with bleaching solution. In the event this treatment is insufficient, it may be necessary to burn or bury such material.

(7) Detailed information on decontamination is contained in FM 21-40, TM 9-850, and in Training Circulars Nos. 38 and 50, War Department, 1941.

APPENDIX

REFERENCES

1. Standard Nomenclature Lists.—*a. Ammunition.*

Ammunition instruction material..... SNL P-7

Propelling charges..... SNL P-3

Fuzes, primers, and blank ammunition..... SNL P-6

Separate loading projectiles..... SNL P-1

b. Cleaning, preserving, and lubricating materials. SNL K-1

c. Major items of railway and permanent and semi-permanent artillery..... SNL E-1

d. Sighting and fire-control equipment.

Major items of harbor defense, railway and antiaircraft artillery sighting equipment and fire-control instruments..... SNL F-2

Firing tables..... SNL F-69

e. Maneuvering material and supplies..... SNL N-1

f. Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the Ordnance Publications for Supply Index (OPSI).

2. Explanatory publications.—*a. Ammunition.*

Ammunition, general..... TM 9-1900

Coast artillery ammunition..... TM 4-205

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3. Firing tables.—a. Mortar, 12-inch, M1912.

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Shell, DP, 1,046-pound, Mk. XXVIII	
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Shell, CI, 700-pound, M1912	
Shell, CI, 1,046-pound, M1907	

b. Gun, 2.95-inch subcaliber.

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c. Current firing tables are as tabulated here. An up-to-date list of firing tables is maintained in SNL F-69

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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(For explanation of symbols see FM 21-6.)

